TECHNOLOGY DEPARTMENT
32nd Year

DECEMBER, 1948

RUBBER AGE

DEC 21 1948
DETROIT

AVOID DUST

USE

RODFORM PRODUCTS

• • • Eliminate dusting annoyance of the powdered accelerators in compound and mill rooms. Get faster mixing and better DISPERSION.

A line of RODFORM Dustless Accelerators is available:

BISMATE
SELENAC
CUMATE
LEDATE
ZIMATE
TUADS
UNADS

R. T. VANDERBILT CO. INC.
230 Park Avenue, New York 17, N. Y.

Use the Du Pont Antioxidant that Fits Your Needs

	FOR PROTECTION AGAINST		
	NORMAL AGING	HEAT AGING	FLEX FAILURE
1 NEOZONE A	Excellent	Good	Good
2 AKROFLEX C	Excellent	Excellent	Very Good
3 THERMOFLEX A	Excellent	Excellent	Excellent
4 ANTOX	Very Good	Very Good	No Effect

1

NEOZONE A—As a general-purpose antioxidant, Neozone A is outstanding in effectiveness and economy. It provides excellent protection against normal aging and improves the heat-aging and flex-cracking resistance of both natural and synthetic rubber stocks. Equal antioxidant protection may be obtained using Neozone D. However, Neozone A is much more soluble in elastomers, hence is preferable.

2

AKROFLEX C—Second only to Thermoflex A for protecting stocks against all three types of deterioration. Gives protection equal to Thermoflex A against normal aging and heat, but is slightly less effective against fatigue failures.

3

THERMOFLEX A—For applications requiring *maximum protection against all three types of deterioration* . . . normal aging, heat, and flexing . . . Thermoflex A is unmatched. Especially effective as an inhibitor of flex cracking. Specify Thermoflex A for difficult jobs where only the best antioxidant protection will do.

4

ANTOX—Produces excellent aging stocks which discolor only slightly on exposure to sunlight. Antox also results in stocks having very good heat resistance. And, too, Antox activates cure . . . reduces accelerator requirements.

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.),
Wilmington 98, Delaware

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Tune in to Du Pont "Cavalcade of America," Monday Nights—NBC Coast to Coast

THE RUBBER AGE, published monthly by The Palmerton Publishing Co., Inc., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered as second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. December, 1948. Vol. 64, No. 3.

You knead color in margarine

...and discover an amazing combination of properties in HYCAR

THIS new pouch-package for oleomargarine deserves the award* it got. It is made from a combination of Hycar and vinyl resin. The idea may lead to a whole new chain of improved packages. With one twist, a housewife discharges a color capsule into the white margarine, quickly kneads it through and soon has the golden spread she likes to serve on the table.

Just think what they're asking of this pouch! Transparency—so a woman can see what she's doing. Flexibility—so the kneading operation can be easy and quick. Great strength—so there's no danger of its breaking open in her hands. And in addition, the package must be tasteless, odorless and appetizing in appearance. If it were not for Hycar American Rubber this package might not have been possible.

This is one outstanding example of the many development ideas that Hycar American Rubber has helped make possible. It suggests ways for making old products better, cheaper or both—for lowering processing costs—for creating markets for brand new products. For instance, Hycar can now be put into formulations with Geon polyvinyl materials—and you do away forever with migrating plasticizers!

We make no finished products from Hycar, but we are glad to supply information and to help with any special problem. Write B. F. Goodrich Chemical Company, Dept. HB-12, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

*Delrich E-Z Color Pak (Cudahy) Packaging Award, Modern Plastics competition. Visten Film by Visking. Package by Shellmar.

Hycar
Reg. U. S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

SANTA CLAUS IS COMING...TO TOWN!

What a load of wonderful gifts Santa gives you with Philblack O!

The best gifts of all are excellent abrasion resistance and a longer flex life with high resistance to cut and crack growth. In addition, this HAF (High Abrasion Furnace) black gives you many other valuable gifts that make life much easier for any rubber manufacturer! Easy processing . . . smooth extrusions . . . shorter mixing cycles, just to mention a few!

If you'd like to know all the good things Philblack O can give you, send for a trial order of Philblack O now and convince yourself.

PHILLIPS PETROLEUM COMPANY

Phillips 66

Rubber Chemicals Division

EVANS BUILDING · AKRON 8, OHIO

Hot air not needed

A new Geon latex film-forming at room temperatures

THE man has just dipped his finger into a new Geon water-borne resin known as Geon Latex 31X. It will dry on his finger, in the air, at ordinary room temperature, rapidly and evenly.

If you package foods or deal in fresh fruits and vegetables . . . or if you're looking for a better adhesive . . . or want to make a water paint with a water-impervious film that will dry at simple room temperature . . . or if you're dipping toys, gloves, packages, etc., where the form has a complicated shape and a thin flexible wall or covering is required—you'll want to know more about Geon Latex 31X.

The deposited film is flexible, but contains no plasticizer. It is odorless, resistant to grease, and has low moisture vapor transmission. It won't support a flame. Adheres readily to paper, wood, fiberglas, and textiles.

A distinct advance, a cost-cutter, a product-improver, you will agree—and we'll be glad to send our special bulletin giving complete details. We make no finished products from Geon Latex 31X or any of our other raw materials. We are interested, however, in any problems or special applications. For the special bulletin, please write to Department R-12, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

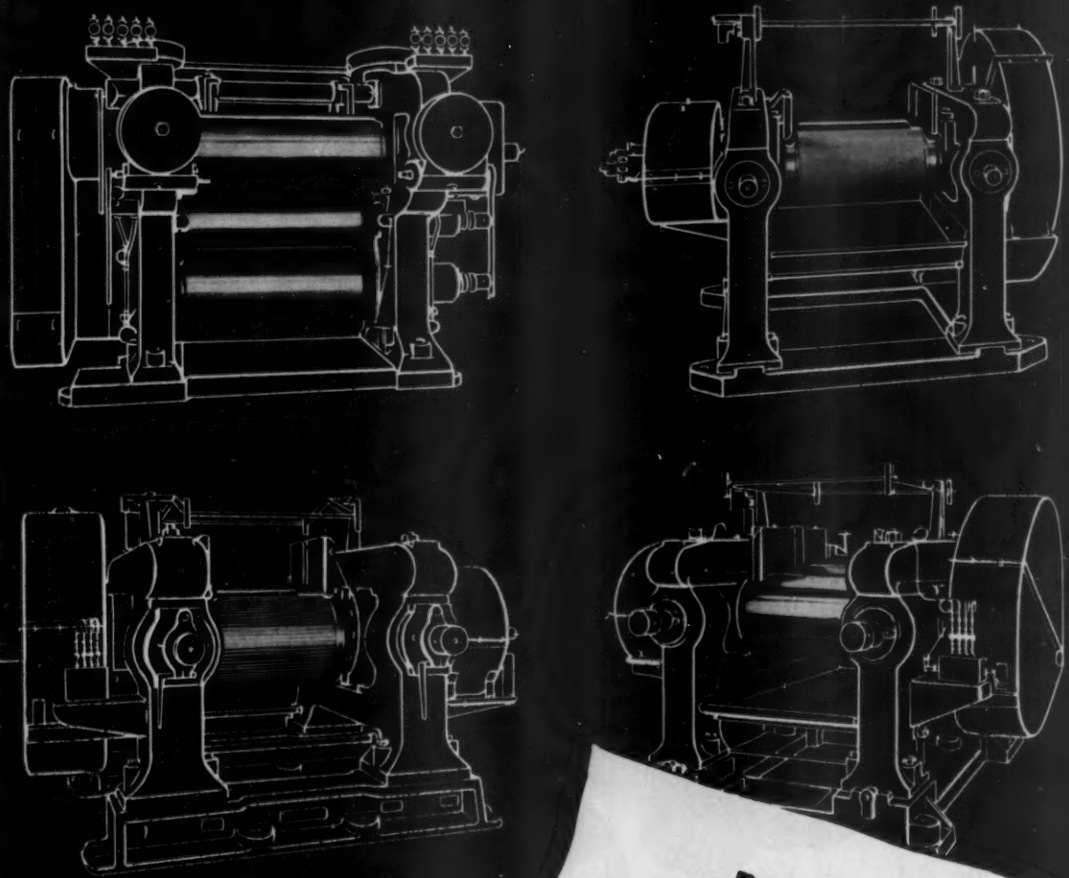
For technical data please write Dept. CB-12

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals



ROLLS THAT FIT INTO YOUR PLANS for improved processing efficiency

Farrel-Birmingham roll designs are the result of experience accumulated in designing and building a wide variety of processing equipment during a century of service to the rubber industry. These designs have kept abreast of, and in many cases anticipated, the roll needs of the industry.

Farrel-Birmingham rolls are produced in the *world's largest specialty roll shop* at Ansonia — a shop equipped to make rolls of any size required, and in many different metal formulas, of chilled iron, alloy iron, gray iron, Meehanite metal or steel.

Farrel-Birmingham

Akron-Standard stock servicers are made in many sizes. Both sets of stock rolls are connected together by chain drive to sprockets from motors mounted on side of frame.

Akron-Standard stock servicer for truck and tractor tire-building machines.

Another Akron-Standard aid to modern, streamlined production—a stock servicer which supplies material to the tire builder without leaving his position (ideal for women operators). It handles plies, chafers, tread and breaker. No placing of fabric in loose liners—no more unnecessary handling anywhere! Uniform tension makes for a uniform product.

The tire builder controls each roll with an index button which operates the motor drive. A limit switch automatically stops the roll. The stock rolls are filled so that each ply comes in proper sequence with the cord angles reversed correctly as applied to the drum. The Akron-Standard stock servicer is ideal for any machine building passenger, truck or tractor tires.

Details. On one side of the upper unit are 12 rolls, six of which carry the self-winding liner and six the stock fabric for the operator. The stock is fed to the rolls at the back. When filled, the turret is turned, permitting the operator to build several more tires before another turn.

Ask for our 40-page Bulletin "A-12", describing this and many other profit-earning types of Akron-Standard equipment.

The Akron Standard Mold Co.

1624 Englewood Avenue — *"The Established Measure of Value"* — Akron 5, Ohio, U. S. A.

IT PUTS 233% MORE BOUNCES IN BASKETBALLS!

BASKETBALL cover stocks, too, enjoy added flex-life when reinforced by **Pliolite S-6.**

Tests showed that a typical rubber-covered basketball failed from flex-fatigue after 18,000 cycles that compressed it one-third. When **Pliolite S-6** was incorporated in the rubber stock, flex-fatigue life was increased up to 60,000 cycles — a jump of 233%.

Pliolite S-6 also improves abrasion resistance, keeping the ball looking better, longer. Laboratory tests prove weight loss through abrasion is 42% less when **Pliolite S-6** is added to the rubber stock.

Then, too, a well reinforced, light-gravity cover stock made with **Pliolite S-6** permits a better weight distribution throughout the ball.

Pliolite S-6 is a superior colorless reinforcing material. It is well adapted to all compounds needing a light-color, low-gravity stock of 70-100 durometer hardness with good processing characteristics and moldability. Its reinforcement is positive — coupling extra hardness with negligible loss in elongation. Often elongation is improved.

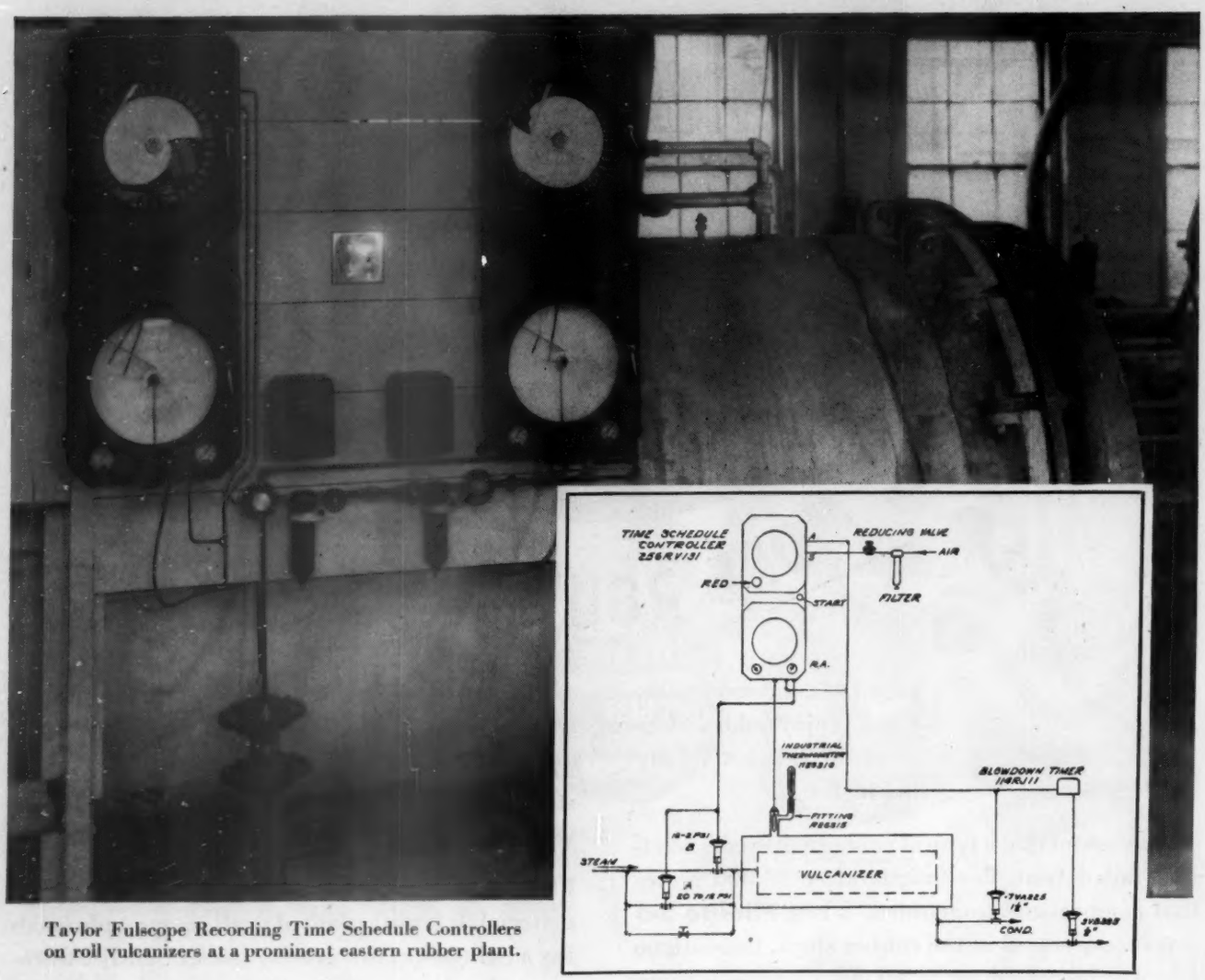
You'll find **Pliolite S-6** to be effective with GR-S, Neoprene, Buna N and natural rubber. It is available as a powder for your own mixing, or in master batches in whatever rubber you select. For complete information and sample, write: Goodyear, Chemical Division, Akron 16, Ohio.

PLIOLITE S-6

GOODYEAR

Pliolite—T.M. The Goodyear Tire & Rubber Company

For perfectly cured rubber rolls Install these accurate controls!



Taylor Fulscope Recording Time Schedule Controllers on roll vulcanizers at a prominent eastern rubber plant.

HERE is a battery of Taylor-controlled roll vulcanizers recently installed for a leading maker of rubber coated metal rolls. Each is masterminded by a Taylor Fulscope Recording Time Schedule Controller (two shown) which delivers a consistently uniform product by automatically holding the same temperature *both inside and outside* the roll during each cycle.

Here's what happens once the operator pushes a start button:

1. Air admitted to Time Schedule Controller and Blow-down Timer.
2. Steam valves admit steam to vulcanizer and inside rolls to be cured.
3. Time Schedule Controller completely and automatically regulates rate of rise and cure temperatures.
4. Blow-down Timer automatically controls removal of condensate from vulcanizer.
5. At end of cure steam valves are closed. Blow-down valve opens and condensate valve closes.
6. Time Schedule Controller stops automatically with cam and trip units in start position for beginning of next cycle.

IMPORTANT: Interrupter timers built into each Time Schedule Controller make it possible to change rate of rise and cure periods without cutting new cams.

This is another example of how accurate Taylor control is helping makers of rubber and rubberized products keep quality up and costs down. Ask your Taylor Field Engineer how we can help *you*. Or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

▼ ▼ ▼

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

DOUBLE-CHECKED ✓ CHEMICALS FOR THE RUBBER INDUSTRY

TETRAETHYLTHIURAM DISULFIDE

SHARPLES ACCELERATOR 62-0

PROPERTIES:

Appearance	cream colored powder
Specific Gravity at 20°/20°C.	1.17
Melting Point (approx.)	69°C.
Molecular Weight	296.4

USES:

AS A:

Primary Accelerator	Vulcanizing Agent
Secondary Accelerator	Retarder for neoprene

IN:

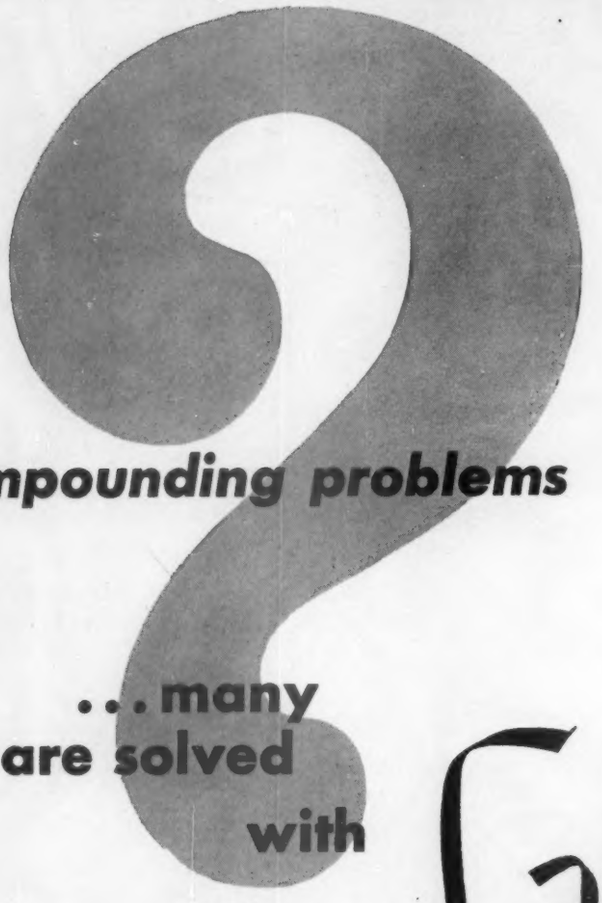
Latex	Inner Tubes
Wire Stocks	Mechanical Goods
Sponge Rubber	Heat Resistant Stocks
Tires	Non-Tarnishing Stocks

WITH:

Natural rubber	Nitrile rubber
Butyl rubber	Neoprene
Styrene rubber	

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC. PHILADELPHIA • NEW YORK • CHICAGO • AKRON



compounding problems

. . . many are solved with

Calcene* T and Silene* EF

The properties of these Columbia pigments are being used advantageously in the compounding of both natural and synthetic stocks for a wide variety of products. They are especially useful in attaining desirable qualities for non-black stocks.

CALCENE T is a white, coated, precipitated calcium carbonate of fine particle size. It confers high tensile strength, resistance to tear and abrasion, low modulus, smooth, fast extrusion and good general processing properties.

SILENE EF is a white, very finely divided, precipitated, hydrated calcium silicate. It confers high modulus, hardness, tear resistance and good tensile strength up to high loadings.

DATA FURNISHED ON REQUEST—Data is available covering a wide range of uses for Calcene T and Silene EF. You are invited to write for it, without obligation.

*®

COLUMBIA CHEMICALS

CHICAGO · NEW YORK · BOSTON · CINCINNATI · MINNEAPOLIS · CHARLOTTE · ST. LOUIS · CLEVELAND · PITTSBURGH · PHILADELPHIA · SAN FRANCISCO

PPG

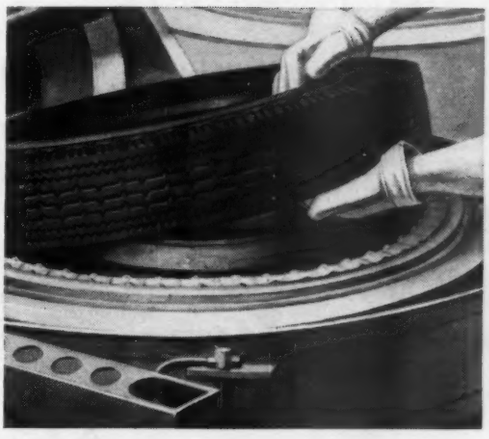
PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Time to switch to G-E Silicone Mold Release Agents!

TAKE A TIP from rubber tire molders. Switch to General Electric silicones for your mold release agents.

Many tire manufacturers have found that G-E silicone oils and water-diluted emulsions permit the rubber to flow more smoothly within molds than is possible with conventional release agents. They report that this results in better-looking tires, less wear and tear on molds and pressure bags, increased production.



Whether you are in the rubber or plastics molding business, G-E silicone mold release agents can help you make a better product...decrease mold down time... minimize reject losses.

Order General Electric silicone oil #9981 LTNV-70 (low viscosity), #81092 (high viscosity), silicone emulsion #81024 (75% silicone) or #81099 (35% silicone) in any quantity from pints to drums. Quick delivery. Write for more details. Chemical Department, General Electric Company, Pittsfield, Massachusetts.

SILICONES for Industry

Please address inquiries about G-E silicone oils to Resin and Insulation Materials Division, Chemical Department, General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

CD48-AH4

Have You Tried

PROTOX-166*

in Your Processing?

PROTOX-166 Zinc Oxide (formerly known as XX-166) is propionic acid treated Horse Head** XX-4.

It retains all of the well and favorably known properties of XX-4 and adds the important processing features of reduced incorporation time, superior dispersions, low moisture pick-up, and lower power consumption. Protox-166, however, is not a premium priced Zinc Oxide.

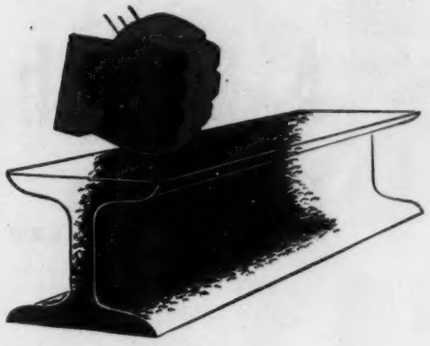
If you have not tried Protox-166 in your processing, we invite you to send for a sample.

HORSE HEAD PRODUCTS

**U.S. Patents 2,303,329 and 2,303,330*
***Reg. U.S. Pat. Off.*

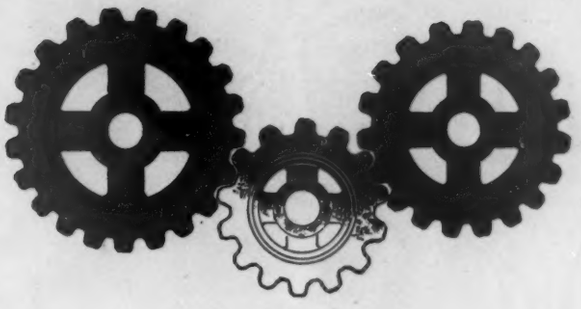
THE NEW JERSEY ZINC COMPANY

160 Front Street, New York 7, N. Y.



SUPERIOR TOUGHNESS

Marvinol's high molecular weight offers you extra toughness and "dryness," longer durable life, greater flexibility, resistance to tear, wear, oils, acids. Marvinol-based products are waterproof.



CLOSE COOPERATION

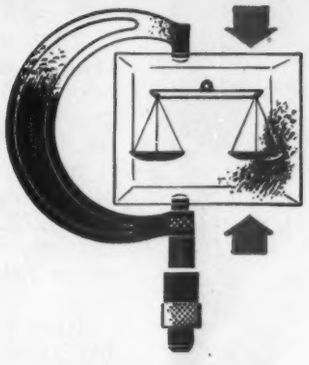
The Glenn L. Martin Company compounds and fabricates only in its customer service laboratory for your benefit. We sell only raw materials. Let our field engineers and customer research laboratory help solve your processing problems. The new ultra-modern Marvinol plant is equipped to insure uniform product of highest quality.

Superior Characteristics of MARVINOL® Vinyl Resin offer you many advantages...

UNIQUE VERSATILITY

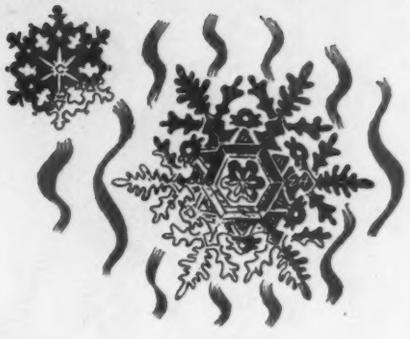
Marvinol VR-10, a polyvinyl chloride-type resin, is readily handled ... may be calendered, extruded, injection molded, used in non-aqueous dispersions, formulated as unplasticized rigids, with distinctive coloring from clear to delicate or brilliant shades that are easy to clean.

WRITE TODAY on your company letterhead for details about Marvinol VR-10. Take advantage of expertly trained Marvinol sales engineers and our modern customer research laboratories. For full information address: Chemicals Division, Dept. R-12, The Glenn L. Martin Company, Baltimore 3, Maryland.



GREATER STABILITY

In processing and in end products, Marvinol offers superior resistance to heat, light, other normally destructive forces.



BROAD TEMPERATURE RANGE

Marvinol resins assure you end products that show less deformation due to heat and better low temperature flexibility.

Martin Marvinol

RESINS, PLASTICIZERS AND STABILIZERS, PRODUCED BY THE CHEMICALS DIVISION OF
THE GLENN L. MARTIN COMPANY · AN INTERNATIONAL INSTITUTION
"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"

A Stitch in time...

"DOC" MacGEE SAYS: The farmer keeps his animals "in tow" by repairing breaks in his fences. The motorist minimizes car troubles by getting seasonal change-overs. All proof of the old adage, "A stitch in time saves nine."

The industrial plant using solvents or naphthas can benefit from this adage, too—for, with naphthas, many things can happen to impair production, halt it entirely, or affect the quality of the finished product. Such things as impurities in solvents . . . varying quality in solvents . . . failure to receive delivery on schedule . . . and shipment in unclean tank cars.

How can the industrial solvent user make a "stitch in time" here? By using SKELLYSOLVE in his operations. Here's why: Skelly Oil Company has pioneered many of the developments in the field of special naphthas; solvents are our *business;* and we're in business to stay!

The purity, uniformity, close boiling ranges, and freedom from foreign tastes and odors in SKELLYSOLVE are jealously guarded and controlled. The high quality of SKELLYSOLVE is always maintained—and it never varies. And finally, for promptness of service . . . for dependability of service . . . SKELLYSOLVE stands alone. The growing number of SKELLYSOLVE users in every field of industry attest to that!

Keep these facts in mind . . . and remember, too, that when unusual problems or difficulties arise, many another "stitch in time" by trained SKELLYSOLVE Technical Fieldmen has saved the day for SKELLYSOLVE users. Why not write us for the full SKELLYSOLVE story . . . today?

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY, KANSAS CITY, MO.

SHELL DUTREX 6

Plasticizer and Extender for heavily loaded Natural Rubber Compounds

SHELL

Direct inquiries to:

SHELL OIL COMPANY, INCORPORATED

50 WEST 50th ST., NEW YORK 20, N. Y.
(East of Rockies Territory)

100 BUSH ST., SAN FRANCISCO 6, CALIF.
(Pacific Coast Territory and Western Canada)

SHELL OIL COMPANY OF CANADA, LTD., 25 ADELAIDE ST., EAST TORONTO, CANADA
(Eastern Canada)

TITANOX . . . *the brightest name in titanium pigments*

MAKE RUBBER WHITER . . .

WITH TITANOX PIGMENTS

● You get *whiter* rubber products when you use TITANOX pigments. These famous titanium dioxide pigments impart not only the greatest amount of whiteness but also brightness and opacity to rubber of all kinds. And in light-colored rubber, an enviable clarity of tint is created by TITANOX pigments.

Let the staff of our nearest Technical Service Laboratory show you how to get the most out of your pigment supply.

They will also cooperate in working out any pigmentation problem you may have. Call on them.

TITANOX

Reg. U. S. Pat. Off.

TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT

111 Broadway, New York 6, N. Y.
104 So. Michigan Ave., Chicago 3, Ill.
350 Townsend St., San Francisco 7, Cal.
2600 S. Eastern Ave., Los Angeles 22, Cal.

6679

LOW-VISCOSITY, POLYMERIC VINYL PLASTICIZER

PARAPLEX G-50

for plasticizing permanence, plus ease of handling

The permanent plasticizing effect of a high-molecular weight polyester plus the simplicity of incorporation and handling of a monomeric-type plasticizer — these are the outstanding advantages of Paraplex G-50 as a modifier for polyvinyl chloride, polyvinyl acetate, nitrocellulose, and acrylic resins. In addition, the low viscosity of Paraplex G-50 makes it of particular interest in dispersion compounding for dipping, molding and extruding work.

CHECK THESE ADVANTAGES

PLASTICIZING PERMANENCE—Paraplex G-50 stocks are outstanding in durability . . . retain their excellent physical properties over long and severe periods of usage.

PROCESSING EASE—For both calendering and extruding compounds, Paraplex G-50 stocks process easily—are notable for smoothness and high finish.

FAST PIGMENT WETTING—Paraplex G-50 is an excellent pigment grinding medium . . . gives better coverage, color uniformity, and pigment binding than monomeric-type plasticizers.

NON-MIGRATIBILITY—Paraplex G-50 does not migrate to the surface of vinyl films on aging . . . ends "lacquer lifting" problems.

NON-EXTRACTABILITY—Like Paraplex G-25 and G-40, Paraplex G-50 is insoluble in oils, fats, water, and aliphatic hydrocarbons—provides soft, flexible polyvinyl chloride compounds with high service resistance.

FREEDOM FROM ODOR AND TASTE—Compounds plasticized with Paraplex G-50 are eminently suitable for rainwear, packaging, tubing and other special applications where lack of odor and taste are important.

ADAPTABILITY TO DISPERSION COMPOUNDING—Free-flowing plastisols made with Paraplex G-50 show outstanding viscosity stability, and can be fluxed satisfactorily at temperatures somewhat higher than those used for monomeric-type plasticizers.

For full details on the characteristics and uses of Paraplex G-50, write for our latest bulletin. Our technical staff will be glad to answer any questions you may wish to ask—and to advise you concerning any application of Paraplex G-50 or its companion resins, Paraplex G-25 and G-40.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

The Resinous Products Division was formerly The Resinous Products & Chemical Company

RECIPE

(Test No. 8408 from the Barrett Rubber Research Laboratory)

FOR

CARBONEX* 644

RUBBER COMPOUNDING HYDROCARBON

in a

Black Natural Rubber Compound for Extruded and Molded Purposes

Compound No. 8408 Recipe	LMY Weight Basis
Smoked Sheets	100.0
CARBONEX* 644 Rubber Compounding Hydrocarbon	30.0
Furnace Black (HMF)	50.0
"THERMAX" (MT)	25.0
"SUNPROOF"	1.0
"B-L-E" 25	1.0
Stearic Acid	2.0
Zinc Oxide	5.0
Sulfur	2.5
"SANTOCURE"	0.5
Total	**217.0**
Mooney Viscosity, ML., 212 F. at 4 minutes	41
Specific Gravity	1.2
RHC, % by weight	46.0
RHC, % by volume	60.2

Mooney Scorch, MS, 220 F.

Minutes	Viscosity
1	26
10	22
20	22

Press Cure at 316 F. (70 lb.)—10 Minutes

Tension and Hardness Data:	Unaged	Aged 14 Days at 70 C.
Stress at 300%, psi.	1350	1400
Tensile, psi.	2000	1550
Elongation, %	450	350
Permanent Set, %	26	22
Hardness, Shore A	75	81
Tear Resistance, Angle, Pounds per One Inch Thickness	175	125
†Abrasion Resistance, duPont, Cc. Loss per Hp-hr.	325	445
Cut-Growth Resistance, De Mattia, Inches per 100 Kilocycles	0.19	0.37
†Compression Set, 40% Constant Deflection, %	26.5	—
†Resilience, Yerzley, % Energy Recovery	66.5	63.0
†Impact Resilience, Goodyear—Healey Rebound Pendulum, % Rebound	53.0	54.9

†Specimens cured 15 minutes at 316 F. (70 lb.)

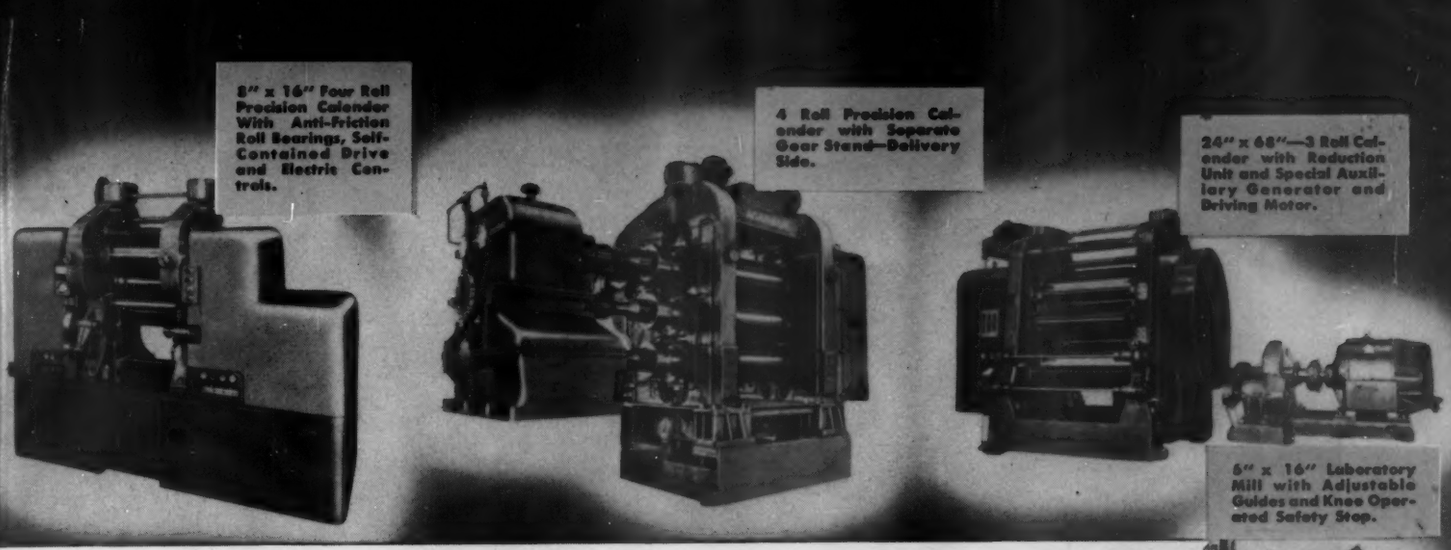
CARBONEX* 644 rubber compounding hydrocarbon, because of its exceptional plasticizing action, greatly modifies the nerve and consequently reduces the shrinkage of the elastomer, a property which recommends its application in extruded and molded items used in the automotive and aviation industry, mechanicals, heels and soles, etc.

CARBONEX* 644 rubber compounding hydrocarbon promotes smooth and rapid extrusion, allowing only small dimensional changes and providing sharp lines in molded goods. It disperses rapidly and improves processibility, and its extending properties recommend it for the design of low-cost quality compounds.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

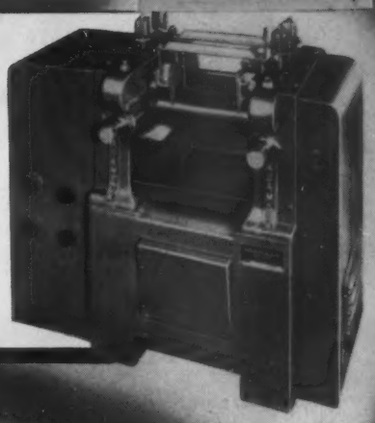
Barrett*

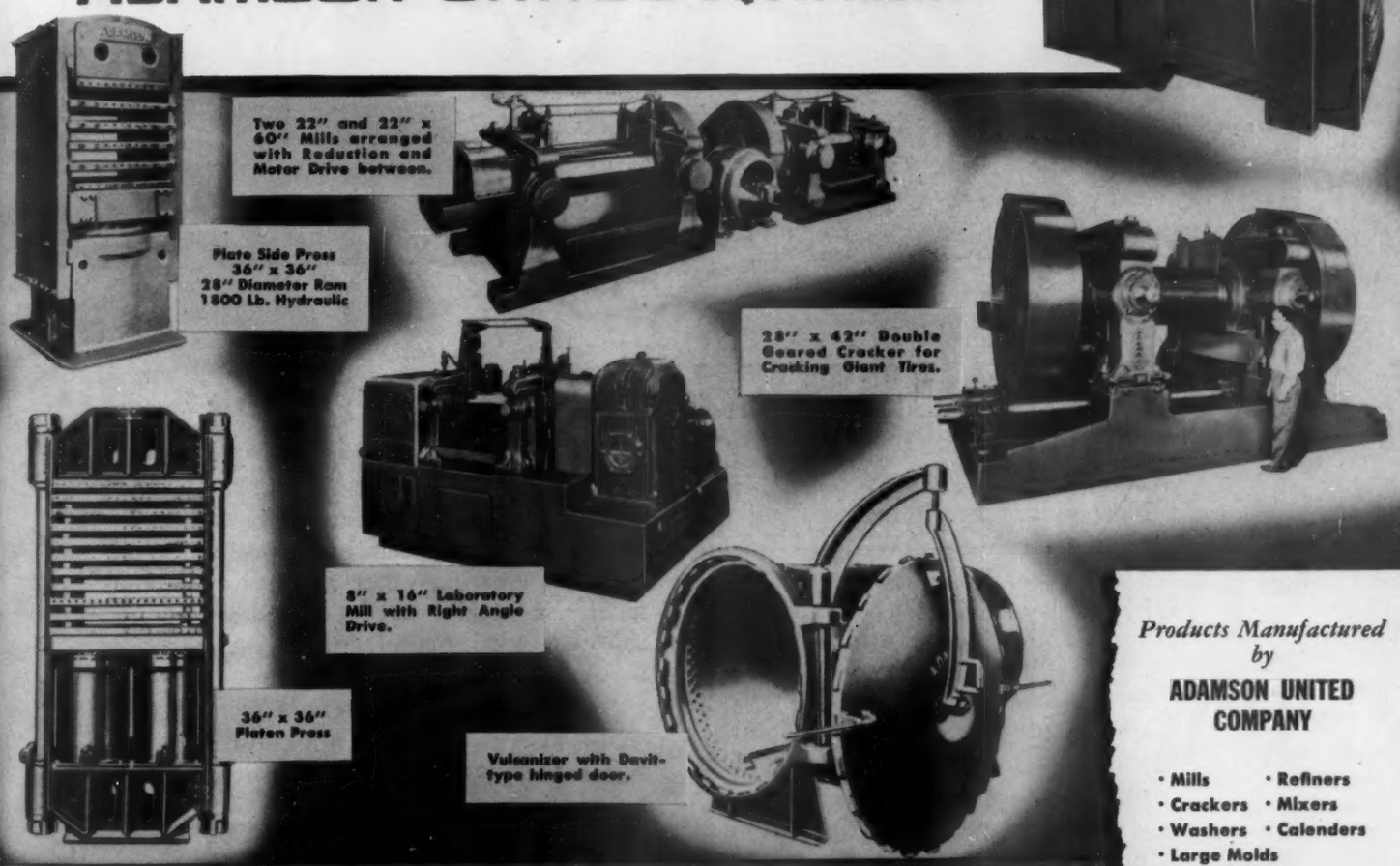
*Reg. U. S. Pat. Off.


8" x 16" Four Roll Precision Calender With Anti-Friction Roll Bearings, Self-Contained Drive and Electric Controls.
4 Roll Precision Calender with Separate Gear Stand—Delivery Side.
24" x 68"—3 Roll Calender with Reduction Unit and Special Auxiliary Generator and Driving Motor.
6" x 16" Laboratory Mill with Adjustable Guides and Knee Operated Safety Stop.

For Every Rubber or Plastics Processing Purpose

ADAMSON UNITED EQUIPMENT

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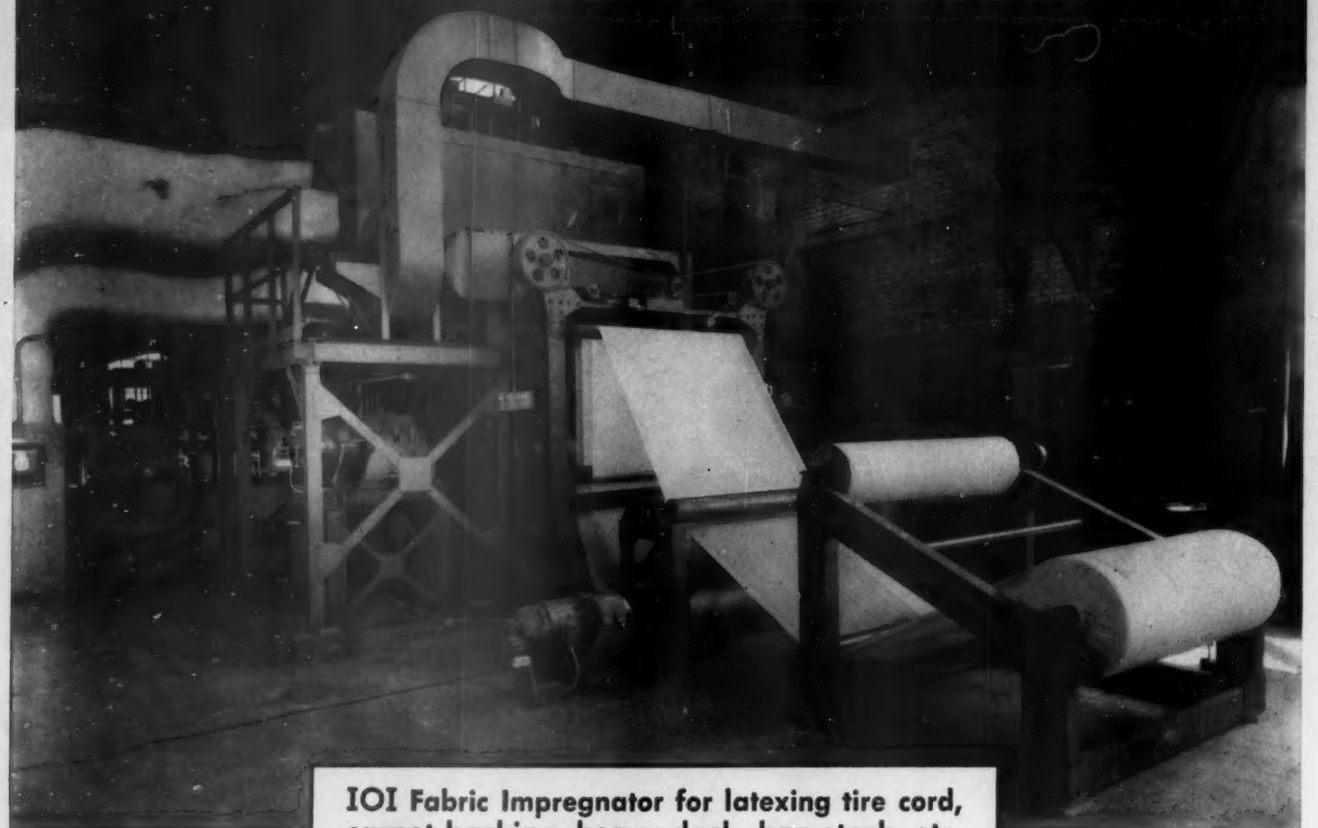

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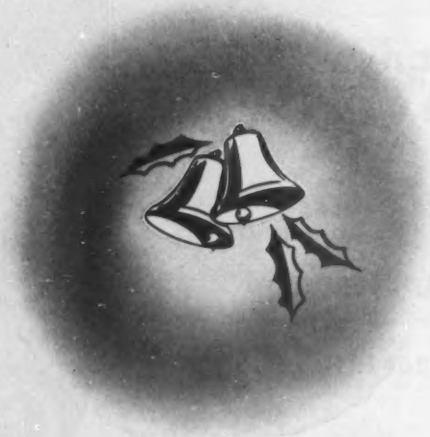

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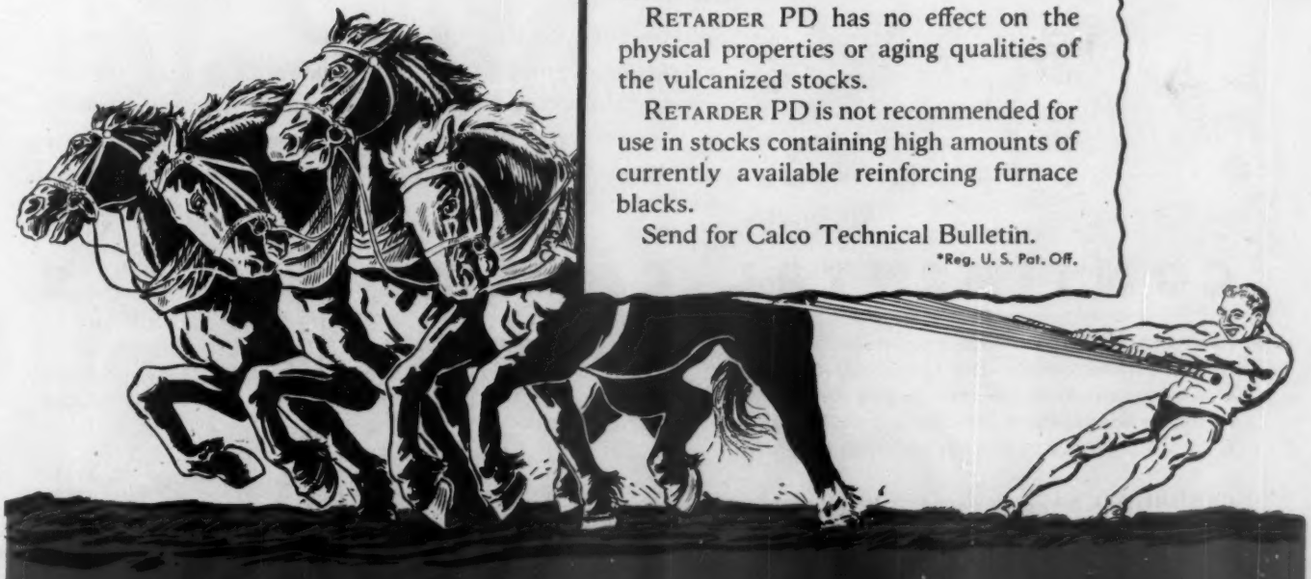

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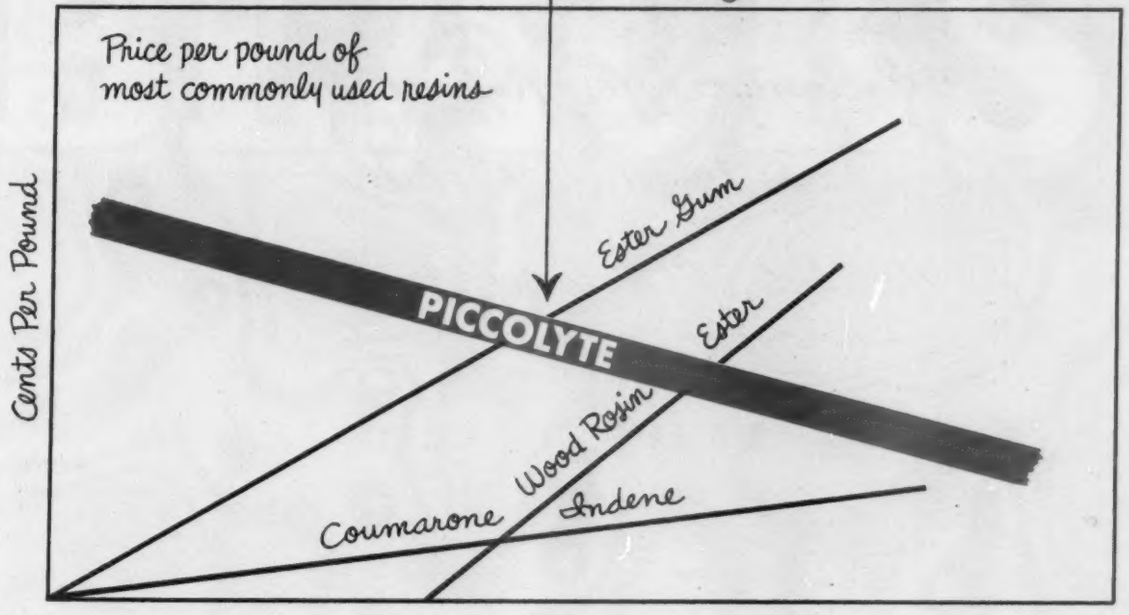

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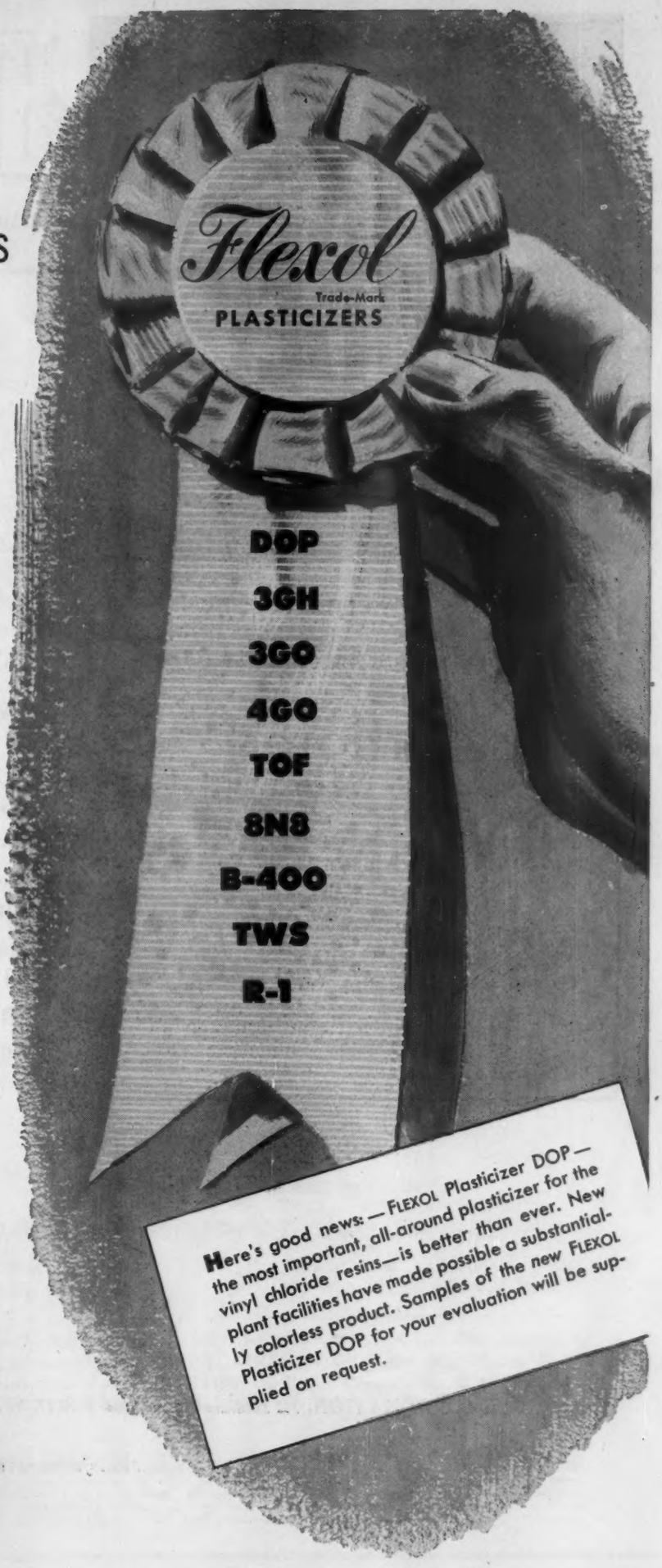
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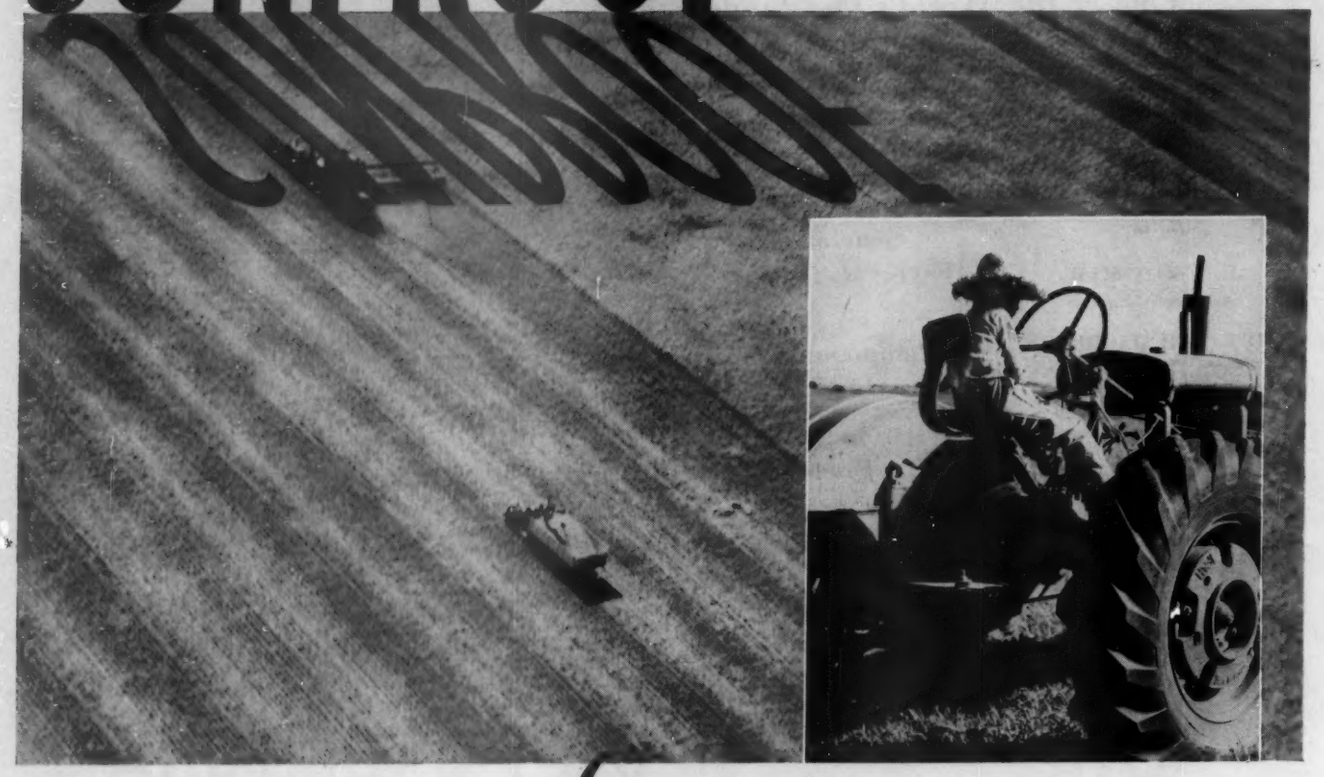

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RUBBER AGE

Vol. 64, No. 3 DECEMBER, 1948

How Handling Costs Were Cut $80,000 Per Year at General Tire's Akron Plant

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BY modernizing existing skid-and-hand-truck methods through the introduction of pallets, motorized hand trucks, and fork trucks, General Tire and Rubber has recently achieved the following savings in handling some 7,500,000 pounds of materials per month at its Akron plant:

1. Handling hours were reduced 58%, resulting in decreased costs of $80,000 per year.
2. Demurrage costs of several thousands of dollars per month were eliminated.
3. Capacity of existing storage space was increased by ceiling-high tiering.
4. Working conditions were improved by the virtual elimination of strenuous handling operations.

The Plan

These large savings were made possible by planning the modernization program. Before buying a single pallet or making a single recommendation to top management, a careful survey was made analyzing existing methods, studying proposed methods, and comparing costs of each. The experience and thoughts of the General Foreman of Receiving and Warehousing, the Manager of Production Planning, the Assistant Manager of the Cost Department, the Foreman of Receiving of Transportation, the Foreman of the Mill Room and the Supervisor of Outside Warehousing were availed of to aid the Methods Department. Thus, operations were planned on a *plant wide* basis rather than a piece-meal or single-operation basis, and the result is a smooth integrated handling system.

The following discussion tells where the savings were achieved, compares old and new handling methods, points out pallet design factors often overlooked by users, and gives data on scheduled maintenance procedure.

Receiving and Warehousing

All components going into the production of rubber are received at the plant warehouse or at one of several outlying warehouses. Size, weight, and form of packaging vary considerably, depending on the item being received. Bales, bags, drums, rolls, and boxes typify incoming shipments.

Under the old system, commodities were loaded onto skids from a boxcar or trailer and transported to storage areas by hand truck. Four men were required to push the hand truck to the unloading zones. At the storage

FIG. 1—Battery-powered Worksavers have replaced hand trucks at the General Tire plant. The Worksavers remove loads directly from freight cars.

FIG. 3—High lift fork trucks transport pallet loads from the receiving platform to permanent storage and tier them to ceiling height, as seen here.

areas, two men piled the load as high as possible while the four truckmen returned for another load. This system required 14½ hours to unload a car.

Under the present system, pallets are used instead of skids. Battery-powered Worksavers and fork trucks replace the hand trucks for transporting and tiering. Material is loaded onto pallets inside the freight car or street truck, as shown in Figure 1. Both ends of a car are unloaded at once. A pallet-type Worksaver (Figure 1) then enters the car, picks up the pallet load, takes it to a scale for check-weighing (Figure 2) and carries it to temporary storage on the receiving platform. Loading-to-stacking takes 16.5 minutes per truck. Cars are now unloaded in less than three hours.

High lift fork trucks transport pallet loads from the receiving platform to permanent storage and tier them to ceiling-height, as shown in Figure 3. The heavier duty fork truck is used in this phase of receiving-warehousing operations because it has greater capacity and higher speed and can lift the load for tiering. The average distance pallets are trucked is 260 feet.

Fork truck tiering makes possible maximum use of overhead space for storage purposes. Zones are kept neat and orderly and inventory is facilitated since pallet loads rather than individual packages are counted. At the main plant the fork trucks sometimes take incoming shipments directly to processing locations or to a temporary storage which feeds the processing operations directly.

Warehousing to Processing

Material is shipped from outlying warehouses to the plant proper by street truck. Formerly, goods had to be repacked on hand trucks at the various storage zones, transported to a street truck, unloaded onto the street truck, transported by street truck to the main plant, repacked on another hand truck, pushed to production or temporary storage locations and unloaded again.

FIG. 2—The pallet loads are taken directly from the freight cars to scales for check-weighing and then are temporarily stored on the receiving platform.

FIG. 4—Worksavers are used for loading and unloading carbon black. It will be noted that the pallet has openings on all four sides for easy handling.

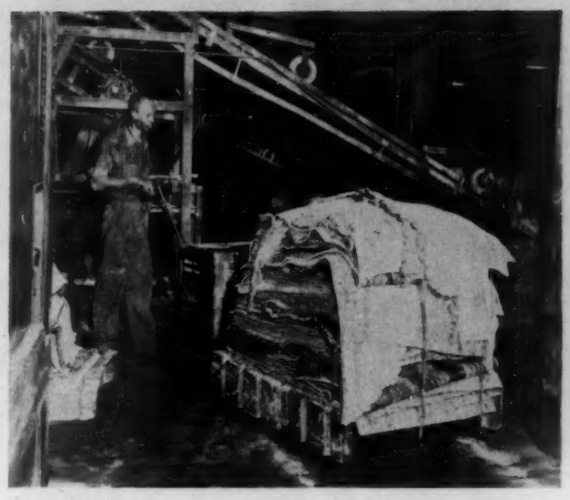

FIG. 5—Being small, light and maneuverable, the Worksavers can operate in narrow areas. Here one is being used to load crude rubber on an elevator.

FIG. 7—End control platform trucks are used to transport stock from temporary storage to the warm-up mills. Hand trucks were formerly employed.

Under the present system, the fork truck takes a palletized load from storage and transports it to the street truck where a Worksaver picks it up and deposits it in the truck. Another Worksaver picks up the pallet load at the main plant (Figure 4) and takes it to the desired location. Thus, many hours are saved in handling and rehandling between warehouse and plant.

The time required for fork trucks to pick up pallets at storage zones, transport them to street trucks, and return for another load, is 7.5 minutes per pallet. The time required for Worksavers to pick up loaded pallets from trailer or car and stack in temporary storage is 5 minutes per pallet. Time required from temporary storage to production is 6.5 minutes per pallet.

Pallet Planning

Careful thought was put into the pallet design feature of the new handling system, with the result that pallet repair and replacement costs, estimated at $6,000 per year, have actually been only $1,200 per year. Pallets are constructed of steel rather than wood, not only to gain added strength and life but also to prevent splinters from sticking into components to be used later in the manufacture of rubber.

The size of the pallets was determined so that two pallets would fit side by side whether trailer or car was used in shipping from outlying warehouses to the main plant. Over-all dimensions are 40 to 48 inches. The 40 inch dimension permits two pallets to fit side by side in the trailer; the 48 inch dimension permits similar loading, without wasting space, in freight cars.

It will be noted in Figure 4, which shows a Worksaver unloading bags of carbon black, that the pallet has openings on all four sides so the forks of the trucks can pick up the pallet-loads from any side. Some 4200 pallets are used in the handling system. Pallet loads average 1800 pounds.

FIG. 6—General uses special skid bins to take stock from cutter to warming ovens. The bin comprises a skid base and an angle iron superstructure.

FIG. 8—The electric hoist on this fork truck maneuvers tire fabric rolls into the dip machines. The iron plugs are inserted into holes at the end of the shaft.

Handling Goods in Process

In handling goods in process, both the Worksaver and the heavy duty end-controlled platform truck are employed. At this point, it will be in order to briefly describe the Worksaver which has accomplished so much of the saving mentioned heretofore. Its advantage over the hand truck is that, being battery powered, it need only be guided by the operator instead of pulled by him.

The Worksaver has advantages over the larger ridden trucks in that it is small, light, and maneuverable. This permits it to operate in narrow and congested passageways, enter elevators, and load street trucks and rail cars which could not be entered by ridden trucks. The light weight of the truck permits its use on second, third, and fourth floors whereas limited floor capacities prohibit use of ridden trucks. This "walkie" type truck is available in capacities up to 6,000 pounds and for a great many manufacturing concerns can lift any load normally encountered in the production processes or in handling raw materials and finished goods.

Figure 5 shows the Worksaver being used to load an elevator. In this particular operation, material is taken from temporary storage on the first floor to the mixing machines on the second floor. Material is loaded onto the elevator on the first floor, the elevator takes it to the second floor, and it is transported to the machines by a second Worksaver.

The special skid bin shown in Figure 6 takes stock from the cutter to warming ovens. The bin comprises a skid base and an angle iron superstructure. The special construction makes it possible to handle a large quantity of odd shaped chunks of crude rubber in one trip. From the warming ovens, Worksavers take the bins to the mixing machines. Formerly, a hand truck was used in the cutting room and required four men to operate. Now the total crew in a cutting room is two men, one for the Worksaver and one for the cutter. The end control platform truck transports stock from temporary storage to warm-up mills (Figure 7).

An interesting and clever handling device is the tool for handling rolls of tire fabric. The rolls are taken by fork truck from the receiving platform to temporary storage where a hoist unloads them. In performing this operation, a chain sling with short pieces of iron bars at each extremity is used. The iron plugs (Figure 8) are inserted into holes in the end of the shaft on which the fabric is wound and the electric hoist maneuvers the roll into the dip machine. Tension on the chains due to the weight of the load holds the plugs in place during the operation.

Maintenance Methods

Truck maintenance is also well planned and carried out at General. Trucks are lubricated every day due to the presence of carbon black throughout the plant. In this connection, closed bearings have been developed to keep carbon black out of the bearings. Two trained mechanics perform all repair operations, each mechanic working an eight-hour shift with four hours between shifts. Trucks receive a weekly checkup on Saturdays when the plant is not in operation. As shown in Figure 9, a Worksaver is hoisted several feet by a special hoisting device to enable mechanics to get at and clean all parts of the truck.

Control of materials handling is centralized under one man in the Materials Handling Department. Truck maintenance is controlled by the Maintenance Department. This setup instigates a "needle" program between the Materials Handling Department and Maintenance Department, the maintenance people keeping the operators on their toes in actual truck operations, and the Materials Handling Department keeping the Maintenance Department on its toes in keeping the truck in good working order.

FIG. 9—All battery-powered trucks receive a weekly check-up. Special hoisting devices are used to enable mechanics to get at and clean all parts of the trucks.

Truck batteries are 21 plate, 6 cell, lead-acid units and are operated 12 hours (two 6 hour shifts) between charges.

Conclusion—The Next Step

It was not difficult to sell the management on this project with the above facts. The new system has been in operation about two years and the actual savings have exceeded the estimate. So much time has been saved in receiving operations that handling equipment is available for use in production and for other purposes. A program is now being studied to mechanize the warehousing and shipping of finished products.

A completely new line of **all-steel Motoreducers** has been announced by the Falk Corp., Milwaukee 8, Wisc. The line includes horizontal and vertical units in both integral and all-motor types for floor, wall or ceiling mount. The basic Motoreducer unit can be converted to right angle, V-belt, multi-speed, low ratio, ceiling mount, and many other applications.

Lyon-Raymond Corp., Greene, N. Y., announces that its standard **hydraulic high lift truck,** which is designed to handle 3,000-pound loads, is now being furnished with boom and chains for die separating. The boom extends 36 inches and the hooks are fastened to sliding rings so that large or small dies can be handled on the 30 by 36-inch platform.

A new **all-steel box-type hand truck** for handling light parts has been developed by the Palmer-Shile Co., Detroit 27, Mich. The vehicle has four pneumatic tires, the two larger ones being stationary. Maneuverability and operating convenience are added by two pivot wheels at the pushing end. Boxes are manufactured to customer specifications.

Compounding of Mechanical Rubber Goods

A Panel Discussion Sponsored by the Chicago Rubber Group

A PANEL discussion on "Compounding of Mechanical Rubber Goods" featured the meeting of the Chicago Rubber Group held at the Morrison Hotel in Chicago, Ill., on October 29. A record attendance of 155 members and guests attended the meeting and participated in the discussion which followed.

The panel of experts comprised the following: H. W. Rehfeld (Inland Rubber); Paul F. Niessen (Victor Manufacturing); W. H. Lussie (Vanderbilt); Dr. Calvin Yoran (Brown Rubber); William M. Hanley (Vail Rubber), and Dr. Leon J. D. Healy, consultant. The panel was arranged by B. F. Benson (Inland Rubber) and A. G. Susie (Marbon) as co-chairmen. Dr. Susie also acted as moderator. The questions submitted to the panel, together with their discussions, follow:

Question: What are the lightest practical densities that can be made on Buna N, natural rubber and reclaim types of chemical sponge?

Answer (By Dr. Yoran): The question of density of sponge rubber is rather complex inasmuch as it varies with the thickness. For example, a compound which may be blown to a density of 0.20 ounce per cubic inch in a half inch thick sheet may give a density of twice that (0.40) in a sheet one-sixteenth of an inch thick. ASTM has established one-half inch as the standard test slab thickness and I think of densities of such slabs as a standard although compounds may show slightly lower densities in thicker sheets. With this qualification that densities are based on one-half inch thickness, I would say that 0.20 ounce per cubic inch would be a practical minimum density for Buna N or reclaim type sponges while natural rubber sponge will probably go down to 0.16 ounce per cubic inch. These densities are what I consider minimums being obtained in the industry in production compounds using bicarbonate of soda as the principal blowing agent. While a number of blowing agents have been put on the market recently, I believe that the bulk of sponge rubber is still being blown with sodium bicarbonate.

Question: Do you recommend application by the consumer of any kind of paint, wax or dressing to minimize sidewall cracking or checking of tires in service?

Answer (by Mr. Rehfeld): Tire paint, or wax, is usually sold as an appearance dressing only. Tire compounds are designed to resist cracking or checking, and paint or wax add little or no protection. It is, however, a good idea to cover tires which are on vehicles in storage, such as farm equipment, in order to protect them from excessive weather or sun exposure during their idle months.

Question: What is the most effective method to reduce backrinding of molded goods?

Answer (by Mr. Niessen): Backrinding, or flashback, which often is a problem in molding thick sections, is caused by the sudden release of internal pressure which is due to the thermal-expansion in the compounding during the rise to curing temperatures. In general, backrinding is affected by the following factors: (1) Volume and shape of the uncured blank in the mold cavity; (2) Type of filler in compound; (3) Ratio of filler to elastomer; (4) Curing temperature and pressure; and (5) Mold design.

To prevent or minimize the phenomenon of backrinding, one or more of the following remedies may be useful: (1) Ring or plunger-type molds are preferable; (2) Control volume of compound used in mold cavity; (3) Use fillers with low coefficient of thermal-expansion; (4) Increase the ratio of filler to elastomer if possible; (5) Avoid curing at high temperatures; and (6) The positive way to eliminate backrinding is to cool under pressure.

Question: How do channel and furnace blacks including the smoothout and high abrasion as well as the SRF types, compare in their effect upon the bonding strength of rubber and metal parts?

Answer (by Mr. Lussie): All channel and furnace blacks, including the fine and medium thermal blacks, give satisfactory performance in rubber-to-metal adhesions. In fact, all types of blacks are being used in the industry, with good results.

Question: To your knowledge, has a satisfactory hydraulic packing compound been developed for operation in Lindol (tricresyl phosphate) at temperatures up to 155° F.?

Answer (by Dr. Healy): Lindol has a powerful softening and swelling effect upon most elastomeric hydraulic packing materials. Probably a combination of Thiokol and Buna N would be about as satisfactory as anything. Approximately 20 parts of Buna N to 80 of Thiokol FA would reinforce the latter for use at this temperature. It would be necessary to compound the stocks separately and then blend them so as to incorporate the requisite curing agents for optimum properties. For minimum compression set, SRF or Philblack A would be preferable in the Buna N component, and P-33 or Thermax in the Thiokol component of the blend.

Question: How are industrial rolls cured?

Answer (by Mr. Hanley): All industrial rolls are cured in open steam after having been jacketed and cross wrapped; the cross wrapping starting from the center of the roll and working out to the ends. The cures are varied depending on the type of stock used, the thickness of the stock and the size of the roll. Generally step-up cures are used with the temperature and time accurately controlled. After curing, the larger rolls are allowed to cool down slowly for periods of as long as two days before grinding.

Question: Can you give some idea of the sizes of industrial rolls?

Answer (by Mr. Hanley): Industrial rubber rolls are of all types, sizes and hardness. The longest roll we have covered was 20 feet long including journals and the largest diameter 30 inches. The heaviest industrial rolls we have handled weigh approximately ten tons and most of these are paper mill press rolls. Industrial rolls range from these large sizes to those weighing only a few pounds.

Question: What determines whether natural rubber or GR-S shall be used in any given product?

Answer (by Mr. Rehfeld): The use of natural rubber or GR-S in tires is controlled by R-1, a regulation issued by the Office of Rubber Director. In products other than tires, the end use and cost are determining factors.

Question: How fresh must Ty-Ply be for best adhesion?

Answer (by Mr. Lussie): The Ty-Plys, rubber-to-metal adhesives, should not be stored for long periods of time. Six months should prove safe.

Question: In what ways does hard rubber type sponge differ from soft sponge as to compounding and molding techniques?

Answer (by Dr. Yoran): In the laboratory, we have made a hard rubber or ebonite type sponge using high percentages of sulfur (30%) with the customary sponge procedures. We have had very little production experience on this item.

Question (by Moderator): Dr. Yoran, perhaps the questioner has in mind hard sponge not necessarily of the ebonite type.

Answer (by Dr. Yoran): In that case, the compounding of hard or firm grades of sponge resembles that of higher durometer mechanical rubber compounds. To secure the required hardness higher loadings of reinforcing pigments are used with a reduction in plasticizer. As to molding techniques, prepared blanks must be closer to final shapes than in soft sponges which blow further.

Question: What is the best acceleration and vulcanizing agent for a Vistanex-Rubber-Durez 12687 compound?

Answer (by Mr. Niessen): Literature and bulletins have been published and circulated throughout the rubber industry on phenolic resin-rubber mixtures as well as on Vistanex-rubber mixtures. In both cases, the accelerators recommended are those which contain the thiazole or thiazyl groups. I would suggest trying accelerators of this type on the three-component compound.

Question: What methods are best suited for avoiding blistering and calender cold checks in high gravity slab soling stocks having Shore A hardness values of 90?

Answer (by Dr. Healy): Blistering and calender cold checks in high hardness slab soling are generally caused by the same conditions. Usually overloading and improper balance of rubber, fillers and plasticizers contribute to these faults. As a general rule stocks which have good calendering characteristics also possess good molding properties. Excessively sticky stocks are prone to trap air during calendering and molding. Likewise, mushy stocks obtained by overloading with fillers and improper plasticizer balance exhibit air trapping characteristics. Stocks having too critical a calendering range should be avoided. Resinous extenders having low, sharp melting ranges are conducive to weak, mushy and sticky stocks at processing temperatures. Resin extenders having a long softening range, notably the modified styrene resins, are usually better for heavily loaded stocks.

To minimize cold check and blistering, the following devices may help: (1) Avoid resinous extenders having low, sharp melting ranges; (2) Prefer resins of the modified styrene type which have long softening ranges as extenders; (3) Maintain uniform warming and calender temperatures; (4) Guard against scorching in processing prior to curing, using retarders if necessary; (5) Calender stock as thin as possible to reduce chances for trapped air; (6) Age stocks before curing; (7) Avoid excessive overflow; (8) Be sure to maintain proper pressure on stock during curing; (9) Keep molds thoroughly cleaned.

Question: What procedure is used in figuring the shrinkage of production molds?

Answer: The consensus of the experts was to use the so-called "slab test" in determining shrinkage. The percentage of shrinkage may be calculated from the difference in dimensions between the mold cavity and the resulting vulcanized piece. Mr. Niessen pointed out that the size of the slab or thickness is not standard and may range from a 4 x 4 inch square to a 6 x 4 inch rectangular shape, or in some instances a circular disc.

Question: Is it possible to control the conductivity of an electrically conductive stock?

Answer (by Dr. Healy): The conductivity of an electrically conductive stock is rather difficult to control unless exacting controls of the compounding ingredients and processing are maintained. A good grade of uniform conductive black is necessary and the moisture content of the fillers must be controlled. Mixing and milling operations must be held constant. The black must be dispersed as quickly and uniformly as possible. Since the conductivity of the rubber is due to the chain structure of the black, excessive milling will tend to destroy this structure and hence reduce the conductivity. For the same reason, scrap stock should not be re-run. The state of cure must also be fairly uniform. Such controls maintained from batch to batch should lead to reproducible stocks with respect to conductivity. The electrical testing of these stocks should also be scrutinized carefully.

Electronik Potentiometers. (Catalog 15-13). Brown Instrument Co., Philadelphia 44, Penna. 8 x 10½ in. 32 pp.

Many schematic diagrams, photographs and dimensional drawings are used to illustrate the constructional features and operating principles of the instruments presented in this catalog. Among the instruments and systems included are the Electronik strip chart electrical control potentiometers, strip chart and circular chart recorders, precision indicators, strip chart and circular chart controllers, indicating controllers, pyrometric switches, thermocouple and radiamatic assemblies, etc. The catalog also presents illustrative tables of various control forms, typical control systems, style selection tables and other data helpful in the selection of proper instrumentation.

The Processing and Reinforcement Characteristics of Low Temperature GR-S with Various Carbon Blacks

By ISAAC DROGIN[1], HESTER R. BISHOP, and PAUL WISEMAN

United Carbon Co., Inc., Charleston, West Virginia

LOW temperature GR-S, conveniently referred to as "cold rubber," is a butadiene-styrene copolymer manufactured in the temperature range of 41° to 0° F. Most of the low temperature GR-S publicized in recent months was made at 41° F. Some was also made at 14° and some at 0° F. The output of "cold rubber" immediately prior to October 1, 1948, was at the rate of 21,000 long tons per year, and its manufacture was limited to four government-owned plants. Standard GR-S, obtained at a polymerization temperature of either 122° or 117° F., was then being manufactured in nine government-owned plants which had an annual operating capacity of 375,000 long tons. On October 1, 1948, the Reconstruction Finance Corporation approved the conversion of half of this operating capacity to produce 183,000 long tons of GR-S at 41° F. and extended its manufacture to eight plants.

The manufacture of butadiene-styrene copolymers in the temperature range of 41° to 0° F. produces GR-S which, when compounded with reinforcing carbon black, is characterized by more difficult processing and higher resistance to abrasion than is experienced with the standard GR-S made at either 122° or 117° F. Carbon blacks play a very important role in the reinforcement of "cold rubber." It appears that some carbon blacks should be more suitable than others in making possible the high resistance to abrasion claimed for low temperature GR-S. Furthermore, there are indications that certain carbon blacks should have an important role in improving the processing of this GR-S.

The considerable publicity attending the development of "cold rubber," the wide interest in its performance, and the intention to increase its production almost ninefold by next year have prompted this study of low temperature GR-S and carbon blacks. The authors undertook to study the processing and reinforcement characteristics of "cold rubber" made at 41°, 14°, and 0° F. and compounded with various carbon blacks. A similar study was made of carbon blacks in natural and synthetic rubber by one of the authors[2] in 1942.

Experimental

I. **Polymers:** The polymers selected for this study comprised standard GR-S-10, polymerized at 122° F., and GR-S, polymerized at 41°, 14°, and 0° F., respectively. The low temperature polymers are identified as: X-435 (67 Mooney) and X-485 (55 Mooney), both made at 41° F.; X-463 (70 Mooney), made at 14° F.; and X-464 (38 Mooney and 42 Mooney), made at 0° F. Natural rubber was included for comparison. GR-S-10 was chosen because it is emulsified with rosin soap which is also used for X-435 and X-485, the 41° F. polymers. The quality of these polymers differed because of variables in their manufacture. As pointed out by Tuley,[3] some of the important variables which are subject to control or choice and which are critical in determining the quality of the finished polymer are: (1) choice of monomers and proportions; (2) emulsifier, catalyst, modifier, and pH control; (3) polymerization temperature; (4) conversion; (5) short-stop and stabilizer; and (6) coagulant. A general description of the polymers studied and the variables entering into their manufacture is given in Table 1.

II. **Carbon Blacks:** Eight types of carbon blacks, comprising twelve commercial brands, were studied with the various polymers. Furnace black was repre-

EDITOR'S NOTE . . .

The recent decision of the Reconstruction Finance Corporation to reconvert fully 50 percent of existing synthetic rubber production capacity to the manufacture of low temperature polymers elevates such polymers to a position of prime importance among the basic raw materials used by the rubber manufacturing industry. It is already evident that carbon black will have an important role in the compounding of these low temperature polymers to improve processing and physical characteristics. Because of this factor, the research staff of the United Carbon Company undertook a comprehensive investigation of the effects on the polymers of the various types of carbon blacks, as represented by twelve of the leading commercial brands. Not only does the article discuss 41° F. polymers, but also those made at 0° and 14° F., and compares all of these polymers with natural rubber and standard GR-S. The results of the investigation are published in full in the accompanying article—the longest ever published in a single issue of RUBBER AGE. Customarily we would spread an article of this length over several issues, but we felt that in view of the importance and timeliness of this study it should be made available to the rubber industry as quickly as possible.

[1] Director of Research.

[2] Drogin, I., "A Study of Carbon Blacks in Natural and in Various Synthetic Rubbers," *R.A. (N.Y.)*, Vol. 51, pp. 483-88 (Sept., 1942); "A Study of Carbon Blacks in Natural and Synthetic Rubber," *J.R.W.*, Vol. 106, pp. 561-69 (Sept., 1942), Vol. 107, pp. 42-49 (Oct., 1942), pp. 272-77 (Dec., 1942).

[3] Tuley, W. F., "Butadiene-Styrene Chemical Rubbers Polymerized at Low Temperatures," *R.A. (N.Y.)*, Vol. 64, pp. 193-96 (Nov., 1948).

TABLE I—GENERAL DESCRIPTION OF POLYMERS STUDIED AND THE VARIABLES ENTERING INTO THEIR MANUFACTURE

Type	GR-S-10	X-435	X-485	X-463	X-464	X-464
Producer	U. S.	Copolymer	Copolymer	U. S.	U. S.	U. S.
Location	Borger	Baton Rouge	Baton Rouge	Borger	Borger	Borger
Reaction Temp., °F.	122	41	41	14	0	0
Modifier	DDM	C-12 (Sulfole)	C-12 (Sulfole)	DDM	DDM	DDM
Short Stop	HQ	DBHQ	DNCB	DBHQ	DBHQ	DBHQ
Coagulant	SA	SA	SA	SA	SA	SA
Viscosity	53	67	55	70	38	42
Emulsifier	Rosin Soap	Rosin Soap	Rosin Soap	F.A.S.	F.A.S.	F.A.S.

DDM, Lauryl Mercaptan; HQ, Hydroquinone; DBHQ, Dibutyl Hydroquinone; DNCB, Dinitro Chlorobenzene; SA, Salt Acid; F.A.S., Fatty Acid Soap.

sented by: Kosmos 60-Dixie 60, reinforcing furnace (RF); Philblack-0 and Vulcan, high abrasion furnace (HAF); Statex-K, very fine furnace (VFF); Kosmos 40-Dixie 40, Statex-93, Kosmos 50-Dixie 50, and Philblack-A, high modulus furnace (HMF); Statex-B, fine furnace (FF); acetylene black, conductive furnace (CF); and Kosmos 20-Dixie 20, semi-reinforcing furnace (SRF). The only channel black used was Kosmobile 77-Dixiedensed 77, easy processing (EPC). Further details pertaining to these carbon blacks are listed in Table 2.

III. Formulations: A tread type of formulation was employed in the study of the various polymers and carbon blacks. The compounds used are shown in Table 3. To achieve easier processing, twelve parts of softener per 100 parts of rubber hydrocarbon were used with the low temperature polymers as against the six parts used with GR-S-10. While a like amount of Santocure accelerator (1 part per 100 parts of synthetic rubber) was used with the channel and furnace blacks in all the GR-S polymers for the processing evaluation, a larger amount of accelerator (1.25 parts per 100 parts of synthetic rubber) was used with the channel black in all the GR-S polymers when evaluating their reinforcement.

IV. Mixing: All stocks were mixed in a laboratory size Banbury B with a capacity of 1355 grams at 1.25 specific gravity. The batch weight was 1200 grams. The rotor speeds were 115 r.p.m. for the front rotor and 102 r.p.m. for the back rotor, or a ratio of 1.127. The pressure of the circulating water was 15 pounds per square inch, and the starting temperature was 85° F. The mixing cycle for all GR-S and natural rubber was 10 minutes, based on the following schedule:

Ingredients	*Cycle (Minutes)*
Polymer and accelerator	0
Zinc Oxide and antioxidant	1
1/2 Black	2
1/2 Black	4
Softeners	7
Discharge	10

Sulfur was added on the mill for seven additional minutes.

V. Processing: The term processing embraces all mill room operations, commencing with the mixing of a stock and continuing through its stages of milling, tubing, or calendering. Though factory tests are the ultimate means for establishing processing characteristics, there are, as pointed out by Garvey, Whitlock, and Freese,[4] by Vila,[5] and by White, Ebers, and Shriver,[6] a number of laboratory tests which can predict factory behavior. These tests are concerned with establishing power requirements, stock temperatures, viscosities, rates of extrusion, scorch, and shrinkage. Following is a description of these tests and the techniques involved:

A. POWER CONSUMPTION—The power consumption was obtained from a General Electric dial-type, two-wire, d.c., watt-hour meter with ten-watt graduations, having a capacity of 15 amperes at 230 to 240 volts.

[4] Garvey, B. S., Jr., Whitlock, M. H., and Freese, J. A., Jr., "Processing Characteristics of Synthetic Tire Rubber," *Ind. Eng. Chem.*, Vol. 34, pp. 1309-12 (Nov., 1942).

[5] Vila, G. R., "Plastication and Processing of GR-S," *Ind. Eng. Chem.*, Vol. 36, pp. 1113-19 (Dec., 1944).

[6] White, L. M., Ebers, E. S., and Shriver, G. E., "Objective Laboratory Testing of the Processability of Elastomers," *Ind. Eng. Chem.*, Vol. 37, pp. 767-69 (Aug., 1945).

TABLE II—BASIC DATA ON THE EIGHT TYPES OF CARBON BLACKS STUDIED WITH THE VARIOUS POLYMERS

Brand	Producer	Type	Basic Fuel	Surface Area * Sq. M. per Gm.	Calc. Average Diameter (Millimicrons)	Color (Nigrometer)	Per Cent Volatile Matter	Per Cent Iodine Adsorption	Oil Absorption Factor	pH
Kosmobile 77-Dixiedensed 77	United	Easy Processing Channel (EPC)	natural gas	106.8	30.0	85.4	5.8	15.6	112	4.3
Acetylene	Shawinigan	Conductive Furnace (CF)	acetylene	56.3	55.5	94.4	1.8	8.9	290	5.1
Kosmos 60-Dixie 60	United	Reinforcing Furnace (RF)	petroleum oil	100.3	31.2	94.7	0.8	14.1	166	9.1
Philblack-O	Phillips	High Abrasion Furnace (HAF)	petroleum oil	69.2	45.2	92.2	1.2	9.5	150	8.6
Statex-K	Columbian	Very Fine Furnace (VFF)	natural gas	63.4	47.8	90.8	1.7	9.0	122	8.9
Vulcan	Cabot	High Abrasion Furnace (HAF)	petroleum oil	205.9	15.2	93.3	0.8	27.3	160	8.0
Kosmos 40-Dixie 40	United	High Modulus Furnace (HMF)	natural gas	33.0	95.0	99.3	1.3	3.1	83	9.0
Statex-93	Columbian	High Modulus Furnace (HMF)	natural gas	38.6	80.9	101.2	0.9	4.5	123	8.7
Kosmos 50-Dixie 50	United	High Modulus Furnace (HMF)	petroleum oil	34.5	93.0	99.1	1.8	3.8	170	8.9
Philblack-A	Phillips	High Modulus Furnace (HMF)	petroleum oil	29.0	80.0	95.7	1.1	4.5	172	8.5
Statex-B	Columbian	Fine Furnace (FF)	natural gas	76.1	41.0	94.6	1.2	5.7	107	9.2
Kosmos 20-Dixie 20	United	Semi-Reinforcing Furnace (SRF)	natural gas	19.5	160.0	103.3	1.1	2.2	87	9.4

* Based on low temperature nitrogen adsorption—Brunauer, Emmett, and Teller Method ("Adsorption of Gases in Multimolecular Layers," *J. Am. Chem. Soc.*, Vol. 60, No. 2, pp. 309-19 (Feb., 1938).

The power consumption was recorded on an Esterline Angus graphic wattmeter with a chart speed of 44 inches per hour.

B. Stock Temperature—The temperature of the stock in the Banbury was obtained with a thermocouple projecting into the mixing chamber from the bottom for approximately ⅛ of an inch. The temperature was recorded on a Brown Electronic strip chart-recording potentiometer with a chart speed of 39 inches per hour.

C. Mooney Viscosity—The viscosity was determined with a Mooney Viscometer, Model NBS, with a rotor 1½ inches in diameter and with platens steam-heated at 212° F. Only the 4-minute reading was reported.

D. Shrinkage—*1. Mill Stock:* The following procedure was used for determining the shrinkage in the length of a stock taken off the mill. At the end of the 7½-minute mixing period of the stock on the open mill, during which time the sulfur was added, the mill roll gauge is set at 0.055 inch for sheeting off the stock. But, before starting the sheeting operation, the mill is stopped, and the shrinkage die—a flat piece of stainless steel, 4 inches wide by 6 inches long, and with a curvature the same as that of the mill roll—is placed lengthwise with the grain of the stock on the front roll, and with the aid of a knife a test piece, the size of the die, is marked off. The marked section is then cut out slightly outside the mark, the cut-out piece is allowed to rest 24 hours on a flat talced surface, and the length of the marked test piece is then measured. The shrinkage is the loss in length from the original 6 inches, and it is expressed in terms of per cent of the original length. Thus,

$$\text{Per Cent Shrinkage} = \frac{(L_o - L_1) \times 100}{L_o}$$

where L_0 = marked length (6 inches) of the test piece on removal from the mill

L_1 = marked length of the test piece after resting 24 hours

2. Extruded Stock: The procedure for determining the shrinkage in the length of extruded stocks was that outlined by Dannenberg and Stokes[7]. The mill stock which had been sheeted off at 0.055-inch thickness was cut into strips approximately 1 inch wide and 6 inches long and in a direction across the milling grain. The strips were fed into the Housatonic extruder, as shown in Figure A, equipped with a circular die having a 3/64-inch opening. The die, head, and barrel were heated to 200° F. with circulated hot water. The barrel of the extruder was kept full of stock, and the extruded stock was not recycled. Beginning at five minutes from the time the stock was first fed into the barrel, slightly over a meter length of stock was extruded, care being taken not to stretch or pull the extruded section as it emerged from the die opening. The extruded stock was pinched off and placed on lightly dusted Holland cloth. After resting for 24 hours in a constant temperature room (at 82° F. and a relative humidity of 45), a length of exactly one meter was cut off and weighed. The per cent shrinkage was calculated from the following:

FIG. A—Housatonic Extruder.

[7] Dannenberg, E. M., and Stokes, C. A., "The Processing Characteristics of Reinforcing Furnace Blacks. 1. Processing Shrinkage," Paper presented before the Rubber Division, A.C.S., Apr. 22, 1948, Chicago, Ill.

Table III—Tread Type Formulations Employed in the Study

Ingredients	Processing			Reinforcement				
	Low Temperature Polymers	GR-S-10	Natural Rubber	Low Temperature Polymers Channel	Low Temperature Polymers Furnace	GR-S-10 Channel	GR-S-10 Furnace	Natural Rubber
Polymer	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Carbon Black	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
RPA #2	—	—	0.22	—	—	—	—	0.22
Sulfur	1.80	1.80	2.25	1.80	1.80	1.80	1.80	2.25
Santocure	1.00	1.00	0.23	1.25	1.00	1.25	1.00	0.23
Barak	—	—	0.60	—	—	—	—	0.60
Zinc Oxide	3.00	3.00	2.50	3.00	3.00	3.00	3.00	2.50
Stearic Acid	2.00	2.00	1.80	2.00	2.00	2.00	2.00	1.80
Paraflux	7.00	2.00	—	7.00	7.00	2.00	2.00	—
Circo Oil	3.00	2.00	—	3.00	3.00	2.00	2.00	—
Pine Tar	—	—	2.00	—	—	—	—	2.00
Bardol	—	—	2.00	—	—	—	—	2.00
Flexamine	1.25	1.25	—	1.25	1.25	1.25	1.25	—
BLE	—	—	1.30	—	—	—	—	1.30
TOTAL	169.05	163.05	162.90	169.30	169.05	163.30	163.05	162.90

$$\text{Per Cent Shrinkage} = \left(1 - \frac{100\ (\text{Sp. Gr.})\ (A)}{W}\right) 100$$

where W = weight in grams of 100 centimeters of extruded stock

A = area in square centimeters of die opening = 0.0113 square centimeters for 3/64-inch opening

Sp. Gr. = specific gravity of the stock = 1.13 for the GR-S compounds and 1.11 for the natural rubber compound

E. Mooney Scorch—Scorch values were obtained with a Mooney viscometer Model NBS, with a rotor 1 3/16 inches in diameter and with platens steam heated at 250° F.

F. Tuber Scorch—The procedure for establishing the scorch time of a stock in the tuber was as follows:

1. Tuber: The Housatonic extruder, as shown in Figure A, was used. The barrel is 1 1/4 inches in diameter and 5 inches long. The screw is 1 3/16 inches in diameter and is solid. It has two flights of threads which start 180 degrees apart at the base of the screw. On each flight there is one thread per each 1½ inches, thereby giving a total thread count of one thread per each ¾ inch of length. The depth of the thread is 13/32 inch. The threads are variable in pitch. The screw is operated at 55 r.p.m. The die is cylindrical with a 3/64-inch opening.

2. Temperature Control: The head and barrel were steam heated with separate steam lines, and the steam was regulated with ⅛-inch needle-valves. Thermocouples were projected in the die adjacent to its 3/64-inch opening and in the steam chambers of the head and barrel. The thermocouples were connected to a Brown Electronic strip chart-recording potentiometer. Industrial type thermometers were also used in the system to verify the recorded temperatures. The extruder was operated at temperatures ranging from 230° to 290° F. Care was taken not to have any temperature variations in the head or barrel during the tests. The maximum variation in temperature was 0.5° F. There was so little difference in temperature between the head and the die that die temperature readings were dispensed with.

3. Test Details: The stock which had been sheeted off the mill at 0.055-inch thickness was rested for 24 hours in a constant temperature room (at 82° F. and a relative humidity of 45) and then cut into strips 1 inch wide by 6 inches long and in a direction across the milling grain. Sixty grams of the strips were fed into the barrel of the tuber. The time was started as soon as the first of the stock entered the barrel. One minute later, and at each 15 seconds thereafter, a sample of the extruded stock, approximately 2 inches long, was pinched off, and the balance of the extruded stock was returned to the barrel for recycling. The sampling of the extruded stock was continued until the stock scorched. This point was readily established because the unscorched stock was always smooth in appearance, whereas with the first sign of scorching the extruded stock assumed a wrinkled and knotty appearance.

The scorch time was taken at the first sign of wrinkles or knots in the extruded stock. The 2 inch extruded samples were arranged during the test on a cardboard in the order of sampling, and, since each signified an interval of 15 seconds in extrusion time, it was very easy to establish the scorch time as soon as the sample took on a different appearance. Figure B shows extruded samples of X-485 (41° F.) with acetylene black, Kosmos 50-Dixie 50, Vulcan, and Philblack-A, extruded at 250° F.

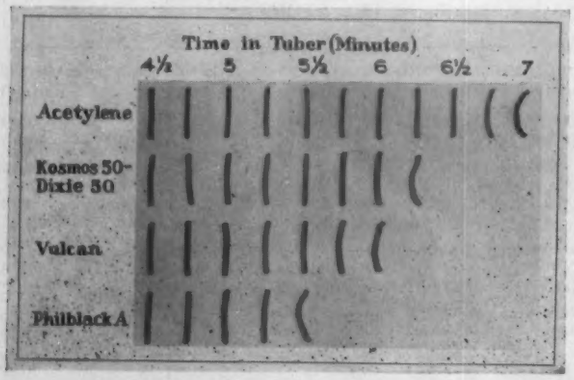

FIG. B—X-485 (41° F. and 55 Mooney). Scorch Time in Tuber at 250° F. with Various Carbon Blacks.

G. Mastication and Set-Up in Mooney Viscosity—The rate of set-up in Mooney viscosity of a stock masticated in the tuber was established in the following manner:

1. Tuber: The Housatonic extruder used for this work is shown in Figure A, and it is described in Section F. The opening in the die was plugged, and the tuber was set at the desired temperature, which ranged from 240° to 290° F.

2. Test Details: The stock which had been sheeted off the mill at 0.055-inch thickness was rested for 24 hours in a constant temperature room (at 82° F. and a relative humidity of 45), and then it was cut into strips 1 inch wide by 6 inches long and in a direction across the milling grain. Thirty grams of the stock were fed into the barrel of the tuber and masticated for various periods of time. The die was then removed and the masticated stock was screwed out of the tuber. The extruded sample was passed four times through the mill, allowed to rest 24 hours in the constant temperature room (at 82° F. and a relative humidity of 45), and then it was evaluated for Mooney Viscosity.

H. Rate of Extrusion—The following procedure was used in establishing the rate of extrusion.

1. Tuber: The Housatonic extruder used for this work is shown in Figure A, and it is described in Section F. A die with 3/64-inch opening was used.

2. Temperature Control: The head and barrel of the extruder were maintained at 200° F. by circulating hot water from two small tanks, one each for the head and the barrel. The water in the tanks was heated by immersion type electric heaters which were controlled by thermostats. The water was circulated continuously by small pumps through the tuber and back into the tanks. The thermocouple arrangement in the tuber, as described in Section F, was also used for recording the temperatures. The maximum variation in temperature was 0.5° F.

3. Test Details: The stock which had been sheeted off the mill at 0.055-inch thickness was rested for 24 hours in a constant temperature room (at 82° F. and a relative humidity of 45), and then it was cut into strips 1 inch wide by 6 inches long and in a direction across the milling grain. Sufficient strips were fed into the tuber to keep the barrel full. The time was started as the first of the sample entered the tuber, and the stock which was extruded between the third and fifth minutes was weighed and the result divided by two constituted the weight of stock in grams extruded per minute.

A cylindrical die, with ⅛-inch opening instead of

3/64, was used in establishing the rate of extrusion at tuber temperatures above 200° F. The heating was then done with steam.

VI. Reinforcement: The following factors of reinforcement were considered:

A. MODULUS, TENSILE STRENGTH AND ELONGATION AT BREAK—The procedure was followed in accordance with the specifications of the A.S.T.M. under Designation D 412-41, adopted in 1941, and using the Henry L. Scott machine.

B. RESISTANCE TO FLEX CRACKING—Tests were made on the De Mattia flexing machine in accordance with the procedure of the A.S.T.M. under Designation D 813-44 T, issued in 1944. Each test specimen was prepared by penetrating the groove with a needle jig, sold by the Precision Scientific Company. The diameter of the needle was 0.050 inch. The machine was operated at 300 cycles per minute and room temperature, and the specimen was flexed to complete failure.

C. RESISTANCE TO ABRASION—The following procedure was employed in determining resistance to abrasion:

1. Abrader: A modified Goodyear angle abrasion machine, as shown in Figure C, was used in this work. The abrasion wheels were 3½ inches in diameter and ¾ inch thick. They were set at an angle of 16 degrees ahead of the center of the grinding stone. The stone was revolved at 80 r.p.m. with load.

2. Extraction of Abrasion Wheels: Recent work by Griffith, Storey, Barkley, and McGilvray[8] on the relationship between laboratory abrasion tests and service performance showed that the abrasion resistance test of GR-S commercial recapping compounds, carried out on the DuPont and Bureau of Standards abrasion machines, gave results which did not agree with road tests. The abrasion loss on these machines was very low because of the formation of a viscous film on the abrasive and on the abraded rubber surface which lubricates the abrasive. It was claimed by Griffith and his coworkers that extraction of the vulcanized rubber, prior to abrasion with ethanol-toluene constant boiling mixture, prevents the development of this film and brings about excellent correlation with road tests.

In view of the above claims, the abrasion tests in connection with this work were made on unextracted as well as on extracted abrasion test wheels. All the wheels were first aged in an air oven for 24 hours at 100° C. Half of the wheels were then extracted in a modified Soxhlet type of apparatus, using ethanol-toluene constant boiling mixture made up of 70 volumes of ethanol and 30 volumes of toluene. The extractor held 16 wheels. They comprised four wheels each from four stocks. The wheels were placed in the extractor in a definite order and were extracted a total of 96 hours. At the end of 48 hours the order of the wheels in the extractor was reversed and the solvent was changed. At the end of the 96 hour extraction period the wheels were placed in ethanol for 24 hours to remove the absorbed solvent from the rubber. The wheels were then air-dried at room temperature for 48 hours before grinding.

3. Test Details: The four unextracted and the four extracted test wheels of each stock were abraded at the same time. The wheels were given a 10-minute-break-in grinding and were then weighed. The wheels were abraded 20 minutes and were then reweighed. The grinding stone was allowed to cool to room temperature between each run. The loss in weight, multiplied by 3, was reported as grams loss per hour.

[8] Griffith, T. R., Storey, E. B., Barkley, J. W. D., and McGilvray, F. M., "Relationship between Laboratory Abrasion Tests and Service Performance," *Analytical Chemistry*, Vol. 20, pp. 837-47 (Sept., 1948).

FIG. C—Modified Goodyear Angle Abrader.

Test Results

The presentation of the results has been arranged to provide a ready comparison of the polymers as well as of the carbon blacks. For instance, the complete results for each polymer with all the carbon blacks are shown in Tables 4 to 10. The results for each carbon black with all the polymers are briefly summarized in Tables 11 to 22. Selected processing data pertaining to extrusion rates at various temperatures, scorch time, and per cent shrinkage for natural rubber, GR-S-10, and X-485 (41° F.), with Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, Philblack-O, and Statex-K, are outlined in Table 23.

Selected reinforcement data for natural rubber, GR-S-10, X-485 (41° F.), X-463 (14° F.), and X-464 (0° F. and 38 Mooney), with Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, Philblack-O, and Statex-K, are outlined in Tables 24 to 26. Table 24 deals with stress-strain; Table 25, with flex cracking; and Table 26, with resistance to abrasion. The rating of the different polymers is presented in Table 27.

Some of the results are also presented graphically. Thus, in Figures 1 to 19, is depicted the scorch time of each polymer with various carbon blacks when tubed at different temperatures. In Figures 20 to 31 is shown the rate of set-up in Mooney viscosity after mastication of the stocks in the tuber at 240° F. for various periods of time. In Figure 32 are represented changes in Mooney viscosity of remilled natural rubber, GR-S-10, X-435 (41° F. and 67 Mooney), and X-485 (41° F. and 55 Mooney), containing Kosmos 60-Dixie 60. Figure 33 deals with extrusion rates at various temperatures for natural rubber, GR-S-10, and X-485 (41° F.), with Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, Philblack-O, and Statex-K.

In Figures 34 and 35 Mooney scorch time at 250° F. is compared with the tuber scorch time at 250° F. for natural rubber, GR-S-10, X-485 (41° F.), and X-463 (14° F.), with eight carbon blacks. In Figure 36 the shrinkage of stocks taken off the mill is compared with that of those which have been extruded, each containing Kosmos 60-Dixie 60. Figures 37 to 48 deal with the

Table 4—Natural Rubber

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
Banbury Data												
Maximum Temperature (°F.)	262	314	288	302	276	326	312	307	262	262	267	267
Discharge Temperature (°F.)	258	310	272	298	270	316	304	302	256	255	260	262
Power (Watt-Hours)	1130	1270	1230	1270	1190	1250	1210	1240	1050	1040	1070	1035
Extrusion Rate at 200° F. (Grams per Minute)	10.7	8.9	7.9	8.9	11.1	11.2	11.4	11.5	12.5	13.4	13.2	13.2
Length Shrinkage, Per Cent												
Mill	26	14	21	15	23	7	11	17	22	19	21	18
Extrusion	53	46	46	49	45	41	46	45	51	50	49	49
Polymer Mooney Viscosity[1]	80	80	80	80	80	80	80	80	80	80	80	80
Compound Mooney Viscosity[1]	55	55	60	58	48	54	46	49	45	40	40	38
Difference between Polymer and Compound Viscosity	—25	—25	—20	—22	—32	—26	—34	—31	—35	—40	—40	—42
Mooney Scorch[2] (Minutes at 250° F.)	23	9	11	10	11	9	7	9	14	20	15	21
Time to Scorch in Tuber (Minutes) *Tuber Temperature* (°F.)												
230	4¾—	4+	4+	4+	4¾+	5—	4¼	4¼+	5¼+	7¾	7	8¾
240	4+	3½+	3¾	3½	4¼	4¼	3¾—	3¾+	4½+	6¼+	6—	6¾+
250	3½+	3+	3¼+	3	3¾—	3¾	3¼	3¼+	4+	5+	5+	5½+
260	3¼—	2¾—	3+	2½+	3¼	3¼	2¾+	3	3½+	4¼	4¼	4½+
270	2¾+	2½—	2½+	2¼	2¾+	2¾+	2½+	2½+	3+	3½+	3½+	3¾+
280	2½+	2¼	2¼+	2	2½	2½	2¼	2¼+	2¾	3¼—	3+	3¼—
Mooney Viscosity[1] of Compound Masticated in Tuber												
Time Masticated (Minutes) / Tuber Temperature (° F.)												
2½ 230	55.7	54.0	57.5	56.1	48.9	54.4	46.7	49.9	45.5	41.0	39.8	39.2
3½ 230	56.2	58.8	60.0	58.8	49.6	55.2	50.6	51.5	47.3	41.5	40.7	39.4
4 230	57.9	—	—	—	51.2	57.5	100.0	74.3	50.9	41.8	42.2	39.6
6 230	—	—	—	—	—	—	—	—	—	44.7	54.2	44.8
7 230	—	—	—	—	—	—	—	—	—	55.2	—	50.8
2 240	55.7	53.4	58.4	56.8	49.3	53.3	46.3	49.7	45.2	40.9	39.3	38.7
3 240	56.4	55.6	59.0	61.9	50.3	54.0	49.8	51.2	45.6	41.2	39.6	38.9
3½ 240	58.5	—	100.0	—	52.6	58.5	—	71.3	45.9	41.3	40.0	39.0
4 240	—	—	—	—	100.0	100.0	—	—	47.0	41.7	40.8	39.4
5 240	—	—	—	—	—	—	—	—	—	44.8	45.7	41.6
6 240	—	—	—	—	—	—	—	—	—	—	—	47.2
1½ 250	56.0	53.6	57.7	56.6	49.3	52.8	46.4	49.2	44.1	40.8	39.3	38.2
2½ 250	56.8	54.4	58.9	58.7	49.9	53.1	47.8	50.5	44.3	41.2	39.4	38.3
2¾ 250	57.4	57.5	59.6	100.0	50.5	54.6	52.1	52.2	44.8	41.3	39.4	38.3
3 250	58.0	—	71.0	—	51.5	59.5	100.0	71.0	46.5	41.4	39.5	38.4
4½ 250	—	—	—	—	—	—	—	—	—	47.5	52.0	43.4
1½ 260	54.9	53.2	57.8	56.9	49.4	49.5	46.2	49.5	44.7	40.6	39.3	38.8
2 260	55.2	54.0	57.5	58.0	49.8	49.7	46.9	49.7	44.7	40.7	39.1	38.9
2½ 260	56.0	—	59.5	—	51.3	51.7	54.0	51.7	45.2	40.8	39.1	39.1
3 260	100.0	—	—	—	100.0	—	—	—	—	41.6	39.6	39.5
3¾ 260	—	—	—	—	—	—	—	—	—	48.0	50.0	45.0
1 270	55.2	53.0	57.8	57.2	49.3	52.4	45.4	48.5	45.1	41.0	39.3	38.4
1¾ 270	55.2	54.0	57.2	58.2	50.0	52.1	45.7	48.7	45.4	41.3	39.3	38.4
2 270	55.4	58.3	57.7	100.0	50.6	52.8	47.3	50.0	45.5	41.6	39.3	38.4
2½ 270	56.6	—	—	—	53.3	69.4	—	—	46.5	42.2	39.8	38.8
3 270	—	—	—	—	—	—	—	—	—	44.9	43.4	40.2
1 280	55.4	53.9	57.6	56.6	50.0	51.7	45.4	49.0	44.7	40.2	39.8	38.3
1½ 280	55.8	53.8	57.3	56.0	49.3	52.0	45.7	49.7	44.7	40.6	40.0	38.3
1¾ 280	56.0	54.2	57.6	100.0	49.6	53.0	47.0	50.8	44.9	41.1	40.1	38.3
2 280	56.4	100.0	58.9	—	50.7	55.1	100.0	—	45.0	41.8	40.2	38.3
2½ 280	58.4	—	—	—	—	—	—	—	100.0	44.0	41.2	39.2

TABLE 4—NATURAL RUBBER (Continued)

Reinforcement Characteristics

Carbon Black Type	Curing Time (Min.)	Temp. (° F.)	Kosmobile 77-Dixiedensed 77 EPC	Kosmos 60-Dixie 60 RF	Philblack-O HAF	Vulcan HAF	Statex-K VFF
Unaged							
Modulus at 300% Elongation	15	280	390	1200	860	780	730
(Lbs./Sq. In.)	30	280	920	1860	1620	1400	1320
	45	280	1170	2100	1800	1590	1560
	60	280	1280	2190	1920	1730	1660
Tensile Strength	15	280	2320	2660	2560	2280	2740
(Lbs./Sq. In.)	30	280	4070	3700	3760	3340	3840
	45	280	4420	4080	3920	3560	4180
	60	280	4500	3880	3960	3560	4160
Per Cent Elongation at Break	15	280	720	520	560	545	640
	30	280	680	510	550	545	615
	45	280	660	505	525	530	605
	60	280	645	475	510	515	580
Hardness, Shore Durometer	15	280	46	53	51	51	50
(Inches × 10^3)	30	280	56	60	59	58	58
	45	280	60	62	61	60	60
	60	280	62	64	61	61	62
Aged [2]							
Modulus at 200% Elongation	15	280	620	1220	920	—	860
(Lbs./Sq. In.)	30	280	880	1300	1090	—	920
	45	280	1000	1330	1220	—	1080
	60	280	1100	1430	1330	—	1220
Tensile Strength	15	280	3140	2820	2840	—	3100
(Lbs./Sq. In.)	30	280	3280	2700	2740	—	2960
	45	280	3280	2650	2650	—	2900
	60	280	3280	2460	2500	—	2860
Per Cent Elongation at Break	15	280	600	410	455	—	550
	30	280	540	375	405	—	520
	45	280	510	355	360	—	460
	60	280	485	320	330	—	425
Hardness, Shore Durometer	15	280	64	65	64	—	64
(Inches × 10^3)	30	280	66	66	66	—	66
	45	280	67	67	67	—	67
	60	280	68	67	68	—	68
Flex (De Mattia), Cut Growth to Failure [4] (Flexes)							
Unaged	60	280	20795	67310	75835	—	89355
Aged [5]	60	280	4020	1865	2329	—	4920
Abrasion Resistance [6] (Grams Loss per Hour)							
Aged [2] and Unextracted	60	280	41.8	20.4	23.4	26.9	34.1
Aged [2] and Extracted [7]	60	280	55.5	35.7	32.0	38.7	43.5
Abrasion Resistance Index (EPC = 100)							
Aged and Unextracted	60	280	100	205	179	155	123
Aged and Extracted	60	280	100	155	173	143	127

(1) ML 4' at 212° F. (2) MS. (3) 24 hours at 100° C. in air oven. (4) 2.5" stroke, 0.5" bend, 300 RPM. (5) 48 hours at 100° C. in air oven. (6) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (7) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

processing data for seven rubbers and six carbon blacks. Banbury data pertaining to maximum temperatures are shown in Figures 37 and 38; power consumption is shown in Figures 39 and 40; shrinkage (mill), in Figures 41 and 42; rate of extrusion, in Figures 43 and 44; Mooney scorch time at 250° F., in Figures 45 and 46; and tuber scorch time at 250° F., in Figures 47 and 48.

Figures 49 to 54 pertain to reinforcement. The resistance to abrasion is shown in Figures 49 to 51; stress-strain, in Figures 52 and 53; and flex cracking, in Figure 54. (EDITOR'S NOTE: Figures appear on pages 342 to 350).

General Discussion

In discussing the results of this study it would be well to bear in mind the differences in the manufacture and viscosity of the polymers and the differences in the manufacture and properties of the carbon blacks studied. The "cold rubber," as shown in Table 1, was made at reaction temperatures of 41°, 14°, and 0° F. The modifier for the 41° F. polymers was C-12 (Sulfole), and for the 14° and 0° F. polymers, lauryl mercaptan (DDM). Dibutyl hydroquinone (DBHQ) was used as the short-stop for X-435 (41° F. and 67 Mooney),

TABLE 5—GR-S-10[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
Banbury Data												
Maximum Temperature (°F.)	312	319	314	310	304	306	296	300	289	278	279	274
Discharge Temperature (°F.)	285	294	285	277	257	283	270	274	259	252	250	253
Power (Watt-Hours)	1345	1360	1405	1330	1290	1250	1270	1290	1240	1190	1195	1180
Extrusion Rate at 200° F. (Grams per Minute)	6.4	11.8	9.4	9.3	8.1	10.2	10.0	10.1	6.6	6.4	7.4	6.9
Length Shrinkage, Per Cent												
Mill	34	20	28	25	32	19	24	23	43	46	42	44
Extrusion	50	40	45	43	47	38	42	42	52	55	51	54
Polymer Mooney Viscosity[2]	53	53	53	53	53	53	53	53	53	53	53	53
Compound Mooney Viscosity[2]	57	55	55	56	48	58	50	50	41	41	40	40
Difference between Polymer and Compound Viscosity	+4	+2	+2	+3	−5	+5	−3	−3	−12	−12	−13	−13
Mooney Scorch[2] (Minutes at 250° F.)	79	43	38	47	46	72	63	59	59	94	85	103
Time to Scorch in Tuber (Minutes)												
Tuber Temperature (°F.)												
240	12	7¼	7¼	10	11	16	13	12	14½	25	25¼	29
250	8¾	6½−	6+	7½+	7¾	12	9¼	8¾+	10¾−	16¾	17½+	21−
260	6¾	5¾−	5¼	6¼−	6¾	9½	7¼+	7+	8¼	12¾	12½−	15¼−
270	5½	5	4½	5¼	5¼	7½+	6+	5¾+	6¾−	9	9−	11
280	4½	4¼+	4	4½	4½	6	5+	4¾+	5½	6¼+	7	8+
290	4	3¾	3½	4	4	4¾	4¼	4	4¾−	5¼	5¾+	6½−
Mooney Viscosity[2] of Compound Masticated in Tuber												
Time Masticated (Minutes) / Tuber Temperature (° F.)												
3 240	53.0	52.7	52.3	53.0	44.0	47.8	48.0	47.8	38.7	38.4	38.7	37.9
6 240	52.5	56.4	56.5	57.4	43.1	47.2	47.8	47.2	37.7	37.3	38.0	36.8
8 240	55.0	—	—	67.5	46.3	48.4	49.2	48.4	38.1	36.8	37.8	36.2
10 240	62.6	—	—	—	57.4	53.5	53.6	53.5	38.7	36.3	37.2	35.8
13 240	—	—	—	—	—	—	—	—	40.7	35.9	38.4	35.5
21 240	—	—	—	—	—	—	—	—	—	40.5	43.4	37.0
27 240	—	—	—	—	—	—	—	—	—	—	—	41.1
3 250	53.4	54.3	51.8	54.3	45.2	55.6	48.9	46.2	39.8	38.7	38.7	38.5
5½ 250	52.8	57.4	64.4	55.2	45.9	54.2	50.0	47.4	39.3	38.4	37.9	37.6
7 250	54.7	—	—	63.6	50.8	54.2	52.6	50.6	39.8	38.5	37.9	37.2
8 250	59.7	—	—	—	—	54.8	57.6	61.0	40.2	38.7	38.0	36.9
10½ 250	—	—	—	—	—	63.6	—	—	53.7	39.1	39.0	36.6
16 250	—	—	—	—	—	—	—	—	—	44.6	54.9	39.0
19 250	—	—	—	—	—	—	—	—	—	—	—	43.4
2 260	55.9	54.0	52.9	54.7	46.0	55.7	49.8	49.1	40.8	39.6	38.7	38.9
4 260	55.2	54.5	63.0	54.2	50.4	54.5	49.6	48.4	40.3	38.8	38.3	37.8
5 260	57.9	70.1	—	55.8	57.8	54.8	49.8	48.4	40.0	38.3	38.3	37.5
6½ 260	—	—	—	—	—	56.0	54.5	56.9	40.8	38.2	39.3	37.2
7½ 260	—	—	—	—	—	58.5	—	—	49.0	38.2	39.8	37.0
11½ 260	—	—	—	—	—	—	—	—	—	51.7	47.8	40.4
2 270	55.8	54.6	53.0	54.9	46.7	56.8	50.0	49.9	40.8	39.3	38.7	39.1
3½ 270	58.0	57.0	68.6	55.6	46.9	56.3	50.2	50.2	40.8	39.7	37.2	39.0
4 270	60.3	63.0	84.0	58.8	53.0	56.0	50.3	50.4	41.7	39.8	37.0	39.0
5½ 270	—	—	—	—	—	56.3	56.5	80.0	46.8	40.2	36.3	39.0
6 270	—	—	—	—	—	57.4	—	—	—	40.4	36.3	39.1
7 270	—	—	—	—	—	71.9	—	—	—	42.0	37.7	39.3
8 270	—	—	—	—	—	—	—	—	—	48.1	44.0	39.6
10 270	—	—	—	—	—	—	—	—	—	—	—	48.0
2 280	55.3	56.5	54.0	55.8	47.3	56.5	48.5	48.7	41.8	39.8	39.8	38.6
3 280	54.3	57.4	73.0	57.6	52.0	55.9	49.3	48.5	41.6	39.3	39.8	38.5
4 280	63.0	81.0	—	63.5	70.5	56.7	52.6	49.4	41.5	40.2	40.0	38.6
4½ 280	—	—	—	—	—	57.8	57.5	69.0	42.0	41.5	40.3	38.7
5 280	—	—	—	—	—	61.9	—	—	45.2	43.8	40.8	38.9
6 280	—	—	—	—	—	—	—	—	—	64.5	45.0	39.2
7 280	—	—	—	—	—	—	—	—	—	—	—	42.2
2 290	55.1	55.7	54.8	53.3	47.7	54.5	47.9	46.4	42.3	40.0	40.4	40.0
3 290	57.6	61.6	73.4	58.9	55.0	55.4	50.3	49.0	43.0	39.7	40.7	40.2
3½ 290	72.5	100.0	—	80.0	68.5	57.7	54.4	54.4	43.8	39.6	41.0	40.3
4 290	—	—	—	—	—	62.8	65.6	—	46.0	40.0	41.3	40.5
4½ 290	—	—	—	—	—	100.0	—	—	—	43.1	42.0	40.8
5½ 290	—	—	—	—	—	—	—	—	—	—	83.2	43.9

TABLE 5—GR-S-10 (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K
Type			EPC	RF	HAF	HAF	VFF
	Curing Time (Min.)	Temp. (° F.)					
Unaged							
Modulus at 300% Elongation	15	290	80	300	320	180	270
(Lbs./Sq. In.)	30	290	500	1430	1160	900	960
	45	290	910	1890	1590	1370	1330
	60	290	1140	2070	1740	1600	1500
Tensile Strength	15	290	140	550	830	420	600
(Lbs./Sq. In.)	30	290	1500	2580	2530	2200	2400
	45	290	2500	3140	3130	2850	2880
	60	290	2930	2970	3130	3130	3170
Per Cent Elongation at Break	15	290	720	530	640	720	660
	30	290	620	490	520	570	580
	45	290	580	465	490	520	530
	60	290	560	410	450	490	520
Hardness, Shore Durometer	15	290	38	47	47	43	45
(Inches × 10[3])	30	290	50	56	55	51	54
	45	290	55	60	59	56	58
	60	290	58	62	60	59	59
Aged[4]							
Modulus at 200% Elongation	15	290	160	2220	2080	—	1880
(Lbs./Sq. In.)	30	290	700	2000	1900	—	1640
	45	290	880	1820	1770	—	1430
	60	290	1020	1750	1620	—	1400
Tensile Strength	15	290	770	3060	2600	—	2800
(Lbs./Sq. In.)	30	290	2800	3200	3230	—	3100
	45	290	2920	3260	3170	—	3100
	60	290	2870	3330	3000	—	3100
Per Cent Elongation at Break	15	290	715	260	235	—	270
	30	290	515	290	290	—	330
	45	290	460	320	305	—	360
	60	290	410	340	310	—	370
Hardness, Shore Durometer	15	290	55	69	65	—	66
(Inches × 10[3])	30	290	64	69	66	—	66
	45	290	65	68	66	—	65
	60	290	65	68	66	—	65
Flex (De Mattia), Cut Growth to Failure[5] (Flexes)							
Unaged	60	290	2575	1935	2100	—	2545
Aged[6]	60	290	2845	1243	3958	—	3558
Abrasion Resistance[7] (Grams Loss per Hour)							
Aged[4] and Unextracted	60	290	28.3	17.6	14.9	19.8	21.8
Aged[4] and Extracted[8]	60	290	40.2	24.1	30.6	28.1	37.4
Abrasion Resistance Index (EPC = 100)							
Aged and Unextracted	60	290	100	161	190	143	130
Aged and Extracted	60	290	100	167	131	143	107
Goodrich Flexometer, 30′ Cycle (° F.)	60	290	291	259	260	—	265
Firestone Flexometer, 60′ Cycle (° F.)	60	290	244	243	235	—	228

(1) Polymerized at 122° F. Mooney Viscosity 53. (ML 4′ at 212° F.). (2) ML 4′ at 212° F. (3) MS. (4) 24 hours at 100° C. in air oven. (5) 2.5″ stroke, 0.5″ bend, 300 RPM. (6) 48 hours at 100° C. in air oven. (7) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (8) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

X-463 (14° F.), and X-464 (0° F.), and dinitro chlorobenzene (DNCB) was used for X-485 (41° F. and 55 Mooney). The 41° polymers were emulsified with rosin soap, and the 14° and 0° F. polymers were emulsified with fatty acid soap. The viscosity of the polymers ranged from 38 to 70.

The twelve carbon blacks studied were manufactured by the channel and furnace processes. The basic fuel for six of the carbon blacks was natural gas and for five carbon blacks it was petroleum oil. One carbon black was made from acetylene. The furnace blacks were produced in specially designed furnaces, each operating under specific burning conditions. As outlined in Table 2, the carbon blacks differ materially in physical and chemical properties. Some blacks have a high degree of structure, others much less. The particle diameters averaged from 30 to 160 millimicrons.

The channel black was acidic, but the furnace blacks were alkaline. The amount of volatile matter in the channel black was close to five per cent; that of the furnace blacks was between one and two per cent. The color (nigrometer) of the channel black was 85 and

TABLE 6—GR-S X-435[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
Banbury Data												
Maximum Temperature (°F.)	320	337	331	320	311	327	300	314	298	292	292	284
Discharge Temperature (°F.)	278	299	276	276	254	262	261	263	257	210	247	250
Power (Watt-Hours)	1360	1320	1380	1360	1295	1140	1160	1225	1170	1145	1125	1130
Extrusion Rate at 200° F. (Grams per Minute)	6.6	15.0	10.8	13.2	11.5	15.1	15.8	15.2	11.8	14.6	13.9	13.8
Length Shrinkage, Per Cent												
Mill	42	22	40	33	44	13	22	23	41	40	37	36
Extrusion	53	43	53	47	51	38	42	44	52	50	51	53
Polymer Mooney Viscosity[2]	67	67	67	67	67	67	67	67	67	67	67	67
Compound Mooney Viscosity[2]	77	78	74	77	66	72	70	72	57	55	55	53
Difference between Polymer and Compound Viscosity	+10	+11	+7	+10	−1	+5	+3	+3	−10	−12	−12	−14
Mooney Scorch[3] (Minutes at 250° F.)	35	21	20	25	24	42	31	27	31	47	44	58
Time to Scorch in Tuber (Minutes)												
Tuber Temperature (°F.)												
240	4¼	3¾	4¼	5	4¾	7¾	5¼	4¾	5¼—	8¼	7¼	9¼+
250	3¾	3¼+	3¾	4½	4¼	6¾	4¾	4¼	4¼+	6¾	5¾+	7¼—
260	3½	3+	3½	4+	3¾	5½	4¼	3¾+	3¾	5½	5—	6—
270	3¼	3—	3¼	3¾	3¼	4¾	3¾	3½	3¼+	4¾	4¼	5+
280	3	2¾	3	3¼+	3	4	3½	3¼	3	4¼	3¾—	4¼
290	2¾	2¾—	2¾	3	2¾	3¾	3¼	3	2¾+	3¾	3¼	3¾—
Mooney Viscosity[3] of Compound Masticated in Tuber												
Time Masticated (Minutes) / Tuber Temperature (° F.)												
2 240	73.0	78.4	70.1	74.0	63.0	69.6	66.8	70.0	55.1	52.3	52.8	51.3
3 240	72.4	82.7	72.4	75.0	63.6	69.3	67.1	70.0	54.7	51.7	52.2	50.8
3½ 240	76.0	100.0	78.3	77.0	65.7	69.3	70.0	72.0	54.7	51.5	52.5	50.5
3¾ 240	83.4	—	85.0	78.6	68.3	69.4	72.7	76.4	54.8	51.3	52.7	50.4
4 240	100.0	—	100.0	81.0	72.8	69.5	75.8	83.0	55.2	51.3	52.8	50.3
5 240	—	—	—	—	—	71.9	100.0	—	—	51.8	54.0	49.7
6 240	—	—	—	—	—	78.6	—	—	—	53.2	57.5	49.7
7 240	—	—	—	—	—	90.7	—	—	—	62.7	100.0	51.3
8½ 240	—	—	—	—	—	—	—	—	—	—	—	66.0
2 250	72.0	77.0	71.4	74.4	63.0	69.5	67.7	70.3	55.0	52.6	53.2	50.7
2¾ 250	73.0	83.1	73.8	75.2	63.7	69.2	67.2	70.6	54.9	51.7	52.7	50.3
3¼ 250	75.7	→	81.5	78.0	67.0	69.7	72.8	72.8	55.3	51.4	52.5	50.0
3¾ 250	—	—	—	84.2	76.8	71.0	69.0	71.0	56.6	51.5	52.6	50.0
4 250	—	—	—	89.4	100.0	72.3	7o.2	100.0	60.2	51.6	53.7	50.0
5 250	—	—	—	—	—	77.7	—	—	—	52.3	57.0	50.0
6½ 250	—	—	—	—	—	85.5	—	—	—	67.4	—	54.8
2 260	72.6	79.0	72.4	75.0	64.2	70.5	67.0	70.4	56.0	52.7	53.3	50.9
2¾ 260	75.2	86.4	77.7	77.4	65.3	70.3	67.5	73.9	55.7	51.9	52.8	50.5
3 260	79.4	—	82.6	79.8	67.7	70.2	69.3	77.2	56.3	51.6	52.7	50.5
3¼ 260	100.0	—	100.0	83.3	79.5	70.1	72.3	82.5	58.7	51.4	52.8	50.5
4½ 260	—	—	—	—	—	73.2	—	—	—	55.8	62.0	51.0
5½ 260	—	—	—	—	—	—	—	—	—	—	—	74.0
1½ 270	71.3	78.0	71.3	76.1	61.8	68.0	65.6	71.0	56.0	53.5	54.0	51.2
2½ 270	79.0	86.5	79.0	78.0	70.5	70.1	73.3	74.5	56.0	51.8	53.0	50.8
3 270	100.0	—	100.0	85.7	100.0	72.5	84.0	86.0	60.0	52.0	52.5	50.5
3¾ 270	—	—	—	—	—	78.5	—	—	—	60.0	54.0	50.7
4½ 270	—	—	—	—	—	100.0	—	—	—	100.0	—	56.0
1½ 280	73.4	77.9	73.6	76.3	64.0	70.6	67.4	71.8	56.0	52.7	53.9	51.3
2 280	73.5	80.7	74.5	76.1	64.1	70.4	68.5	71.9	55.8	52.5	53.6	50.8
2½ 280	81.8	100.0	81.8	78.7	68.0	70.9	71.6	75.0	56.0	52.3	53.2	50.4
3 280	100.0	—	—	100.0	—	73.1	80.4	100.0	—	52.5	53.6	50.3
3½ 280	—	—	—	—	—	82.7	—	—	—	55.2	—	51.6
1½ 290	74.2	78.3	73.6	77.8	65.0	70.8	68.7	72.2	55.7	53.0	53.7	51.2
2 290	73.8	82.2	75.2	78.8	65.3	70.5	67.5	72.7	56.0	52.9	53.2	50.7
2¼ 290	74.9	91.8	83.5	81.0	68.8	70.5	69.3	77.3	57.0	53.1	53.3	50.4
2¾ 290	—	—	—	—	—	72.0	82.5	—	—	54.0	55.0	51.4
3 290	—	—	—	—	—	73.6	—	—	—	55.4	100.0	54.0

TABLE 6—GR-S X-435 (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K
Type			EPC	RF	HAF	HAF	VFF
	Curing Time (Min.)	Temp. (° F.)					
Unaged							
Modulus at 300% Elongation	15	290	260	970	800	100	320
(Lbs./Sq. In.)	30	290	740	1730	1500	700	980
	45	290	1070	2040	1800	1180	1270
	60	290	1270	2160	1930	1420	1460
Tensile Strength	15	290	1100	2770	3090	550	1850
(Lbs./Sq. In.)	30	290	4360	3800	3970	2620	3650
	45	290	4620	3880	4240	3480	3930
	60	290	4520	3970	4340	3670	4030
Per Cent Elongation at Break	15	290	960	690	720	945	930
	30	290	775	560	570	730	715
	45	290	700	515	540	660	660
	60	290	630	490	520	610	635
Hardness, Shore Durometer	15	290	51	58	55	49	52
(Inches × 10^3)	30	290	58	63	59	55	57
	45	290	60	65	61	59	60
	60	290	61	66	62	60	60
Aged[4]							
Modulus at 200% Elongation	15	290	580	2200	1860	—	1210
(Lbs./Sq. In.)	30	290	920	1750	1710	—	1120
	45	290	980	1680	1590	—	1070
	60	290	1000	1640	1460	—	1000
Tensile Strength	15	290	3680	3570	3530	—	3720
(Lbs./Sq. In.)	30	290	3750	3970	3900	—	3850
	45	290	3800	3970	4050	—	3850
	60	290	3730	3900	4100	—	3800
Per Cent Elongation at Break	15	290	635	310	315	—	465
	30	290	500	390	360	—	500
	45	290	500	415	385	—	510
	60	290	480	415	410	—	515
Hardness, Shore Duromter	15	290	65	69	65	—	65
(Inches × 10^3)	30	290	65	69	66	—	65
	45	290	65	69	66	—	65
	60	290	65	69	66	—	65
Flex (De Mattia), Cut Growth to Failure[5] (Flexes)							
Unaged	60	290	2240	3835	3080	—	4000
Aged[6]	60	290	1440	1370	1792	—	2150
Abrasion Resistance[7] (Grams Loss per Hour)							
Aged[4] and Unextracted	60	290	33.9	20.8	15.5	19.8	26.0
Aged[4] and Extracted[8]	60	290	38.7	26.6	25.8	31.2	39.7
Abrasion Resistance Index (EPC = 100)							
Aged and Unextracted	60	290	100	163	219	171	130
Aged and Extracted	60	290	100	145	150	124	97
Goodrich Flexometer, 30′ Cycle (° F.)	60	290	234	240	234	—	256
Firestone Flexometer, 60′ Cycle (° F.)	60	290	224	238	230	—	226

(1) Polymerized at 41° F. Mooney Viscosity 67. (ML 4′ at 212° F.). (2) ML 4′ at 212° F. (3) MS. (4) 24 hours at 100° C. in air oven. (5) 2.5″ stroke, 0.5″ bend, 300 RPM. (6) 48 hours at 100° C. in air oven. (7) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (8) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

that of the furnace blacks ranged from 91 to 103. This difference in color is attributable to difference in particle size. All told, differences in basic fuel, in process, and in manufacture resulted in different quality carbon blacks which exerted a profound influence on the processing and reinforcement of the stocks. All the stocks were mixed in the Banbury according to a fixed schedule.

Discussion of Processing

Since the processing of low temperature GR-S is considered at present a major problem, it is expedient to compare the compounded polymers with each other for processing features and also to compare the performance of the various carbon blacks in these polymers. With this in view, there are presented in the fol-

TABLE 7—GR-S X-485[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
Banbury Data												
Maximum Temperature (°F.)	308	323	310	307	300	333	314	314	290	286	291	291
Discharge Temperature (°F.)	279	271	270	241	240	250	246	260	230	240	230	239
Power (Watt-Hours)	1310	1230	1290	1190	1150	1115	1135	1190	1105	1140	1060	1170
Extrusion Rate at 200° F. (Grams per Minute)	8.6	15.0	13.4	14.9	13.2	15.2	15.3	14.8	12.2	12.7	13.2	11.6
Length Shrinkage, Per Cent												
Mill	42	17	25	19	29	9	13	17	34	31	31	43
Extrusion	55	41	47	45	49	36	40	42	53	54	49	51
Polymer Mooney Viscosity[2]	55	55	55	55	55	55	55	55	55	55	55	55
Compound Mooney Viscosity[2]	64	67	63	67	56	71	62	64	52	49	51	48
Difference between Polymer and Compound Viscosity	+9	+12	+8	+12	+1	+16	+7	+9	−3	−6	−4	−7
Mooney Scorch[3] (Minutes at 250° F.)	56	30	30	38	41	50	45	41	49	72	64	89
Time to Scorch in Tuber (Minutes)												
Tuber Temperature (°F.)												
240	5¾	5¼+	5¾+	6½+	7¾	8	7	6¼	8½	12¼	11½−	12¾
250	4¾+	4¾	5	5¾	6+	6¾	5¾+	5¼	6½+	9½	8¾+	10¼
260	4¼+	4¼	4¼+	5+	5¼	5¾	5+	4½	5½	7½	7−	8+
270	4	3¾+	3¾+	4½	4½+	4¾+	4¼+	4+	4¼−	6	5½+	6½
280	3¾	3¼+	3½	4	4	4¼	3¾+	3¾	4+	5	4¾−	5¼
290	3½	3	3¼	3½+	3½+	3¾	3½	3½	3¾−	4½	4¼+	4¾
Mooney Viscosity[2] of Compound Masticated in Tuber												
Time Masticated (Minutes) / Tuber Temperature (° F.)												
3 240	61.4	65.6	59.4	65.4	53.5	68.2	60.0	61.9	48.6	47.0	47.5	—
4 240	62.5	68.3	62.8	66.0	53.5	67.7	60.2	62.5	47.4	46.7	46.7	45.2
5 240	69.0	88.3	79.0	72.0	55.4	67.6	63.4	68.5	47.3	46.3	46.2	—
6 240	—	—	—	91.2	65.6	69.3	87.6	94.0	48.2	46.3	46.4	44.7
7½ 240	—	—	—	—	100.0	92.0	—	—	56.1	46.8	48.4	44.9
9 240	—	—	—	—	—	—	—	—	—	—	—	45.9
10 240	—	—	—	—	—	—	—	—	—	56.4	70.3	47.7
11 240	—	—	—	—	—	—	—	—	—	—	—	50.7
12½ 240	—	—	—	—	—	—	—	—	—	—	—	71.5
2 250	61.8	66.2	60.5	66.3	53.6	69.2	60.5	62.0	48.8	47.8	48.0	—
3 250	—	—	—	—	—	—	—	—	—	—	—	45.7
4 250	65.0	71.8	74.5	67.0	53.7	67.5	63.7	65.3	47.8	47.2	47.0	45.0
4½ 250	100.0	100.0	89.5	70.3	55.3	67.9	68.7	71.7	48.1	47.2	47.0	—
5 250	—	—	—	77.0	58.1	68.3	76.8	100.0	48.8	47.1	47.1	44.3
6 250	—	—	—	—	—	80.8	—	—	55.0	47.1	47.9	—
6½ 250	—	—	—	—	—	—	—	—	—	—	—	44.2
8 250	—	—	—	—	—	—	—	—	—	57.2	76.0	46.9
9 250	—	—	—	—	—	—	—	—	—	—	—	52.3
10 250	—	—	—	—	—	—	—	—	—	—	—	67.3
2 260	61.9	66.0	60.5	66.0	54.4	69.9	60.5	61.9	49.8	47.8	47.7	45.1
3½ 260	72.0	73.0	70.3	69.4	55.2	68.0	62.9	65.7	48.1	47.4	46.8	—
4 260	94.0	100.0	92.0	76.3	60.8	68.0	68.7	73.8	48.3	47.4	46.8	43.8
4½ 260	—	—	—	86.6	74.8	70.7	80.0	—	49.8	47.4	47.3	43.8
5 260	—	—	—	—	100.0	77.0	—	—	54.9	47.5	48.2	—
5½ 260	—	—	—	—	—	—	—	—	—	—	—	44.7
6½ 260	—	—	—	—	—	—	—	—	—	54.2	81.0	—
7 260	—	—	—	—	—	—	—	—	—	—	—	48.7
8 260	—	—	—	—	—	—	—	—	—	—	—	75.0
2 270	62.2	66.2	59.7	65.9	54.6	69.8	61.3	61.8	48.0	47.5	48.0	45.3
3 270	63.0	68.2	65.7	67.9	54.5	69.2	61.5	71.9	48.0	47.1	47.4	44.9
3½ 270	73.0	80.8	80.0	72.8	58.8	71.3	66.8	83.8	49.3	47.2	47.1	—
4 270	—	—	—	84.0	69.9	77.0	82.3	—	52.3	47.9	47.8	45.0
4¼ 270	—	—	—	—	—	—	—	—	—	—	—	45.7
5 270	—	—	—	—	—	—	—	—	—	53.6	56.0	—
5¼ 270	—	—	—	—	—	—	—	—	—	—	—	48.2
6¼ 270	—	—	—	—	—	—	—	—	—	—	—	53.8
2 280	63.7	66.4	61.5	65.3	54.3	69.4	61.5	61.5	48.7	47.9	48.4	45.6
2½ 280	64.0	68.1	66.0	65.3	58.6	69.6	64.0	65.1	48.0	47.5	47.9	—
3 280	66.5	83.0	77.8	72.5	68.0	71.8	70.8	73.3	49.0	47.2	47.3	44.8
4 280	—	—	—	—	—	—	—	—	—	50.9	49.8	45.3
5¼ 280	—	—	—	—	—	—	—	—	—	—	—	73.0
1½ 290	—	—	—	—	—	—	—	—	—	—	—	45.9
2 290	63.5	66.8	62.2	67.5	54.5	69.7	61.3	62.8	48.7	47.3	47.2	—
2½ 290	66.7	72.2	66.0	69.4	58.3	73.4	62.8	65.4	48.6	47.3	47.2	45.5
3 290	76.0	—	100.0	84.0	68.0	85.5	81.5	85.8	50.0	47.6	47.7	—
3¼ 290	—	—	—	—	—	—	—	—	—	—	—	46.5
3½ 290	—	—	—	—	—	100.0	—	—	—	50.3	49.8	47.6
4½ 290	—	—	—	—	—	—	—	—	—	—	—	59.8

TABLE 7—GR-S X-485 (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type			EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
	Curing Time (Min.)	Temp. (° F.)												
Unaged														
Modulus at 300% Elongation. (Lbs./Sq. In.)	15	290	80	380	310	—	120	—	—	—	—	—	—	—
	30	290	460	1170	930	420	600	—	—	—	470	330	480	300
	45	290	770	1600	1320	800	980	—	—	—	730	600	800	580
	60	290	970	1780	1510	1100	1160	—	—	—	890	800	950	690
Tensile Strength ..... (Lbs./Sq. In.)	15	290	200	1170	1570	—	370	—	—	—	—	—	—	—
	30	290	3000	3150	3560	1780	3100	—	—	—	3160	2370	2550	2080
	45	290	4080	3680	3820	2960	3620	—	—	—	3570	2900	2970	2620
	60	290	4180	3770	4060	3400	3900	—	—	—	3470	2930	3100	2770
Per Cent Elongation at Break	15	290	1160	750	875	—	1200	—	—	—	—	—	—	—
	30	290	900	680	720	790	900	—	—	—	920	1000	940	1125
	45	290	760	600	620	740	740	—	—	—	810	870	800	900
	60	290	700	560	575	680	700	—	—	—	710	770	735	835
Hardness, Shore Durometer.. (Inches × 10³)	15	290	41	52	50	—	45	—	—	—	—	—	—	—
	30	290	53	60	57	51	54	—	—	—	48	46	50	46
	45	290	57	61	58	55	56	—	—	—	54	51	53	52
	60	290	58	62	61	57	58	—	—	—	56	54	56	54
Aged[4]														
Modulus at 200% Elongation. (Lbs./Sq. In.)	15	290	310	1930	1420	—	1310	—	—	—	—	—	—	—
	30	290	720	1670	1480	—	1310	—	—	—	—	—	—	—
	45	290	890	1600	1480	—	1190	—	—	—	—	—	—	—
	60	290	910	1560	1320	—	1120	—	—	—	—	—	—	—
Tensile Strength ..... (Lbs./Sq. In.)	15	290	3420	3170	3440	—	2730	—	—	—	—	—	—	—
	30	290	3930	3620	3700	—	3300	—	—	—	—	—	—	—
	45	290	3900	3620	3730	—	3430	—	—	—	—	—	—	—
	60	290	3800	3620	3660	—	3570	—	—	—	—	—	—	—
Per Cent Elongation at Break.	15	290	850	315	370	—	350	—	—	—	—	—	—	—
	30	290	600	385	385	—	420	—	—	—	—	—	—	—
	45	290	550	400	390	—	460	—	—	—	—	—	—	—
	60	290	530	410	410	—	490	—	—	—	—	—	—	—
Hardness, Shore Durometer.. (Inches × 10³)	15	290	60	68	65	—	63	—	—	—	—	—	—	—
	30	290	62	69	65	—	65	—	—	—	—	—	—	—
	45	290	65	69	65	—	65	—	—	—	—	—	—	—
	60	290	66	69	65	—	65	—	—	—	—	—	—	—
Flex (De Mattia), Cut Growth to Failure[6] (Flexes)														
Unaged	60	290	3680	2700	3845	—	5108	1535	2169	2728	5692	5916	4488	5820
Aged[4]	60	290	1585	952	2578	—	1645	490	790	730	1905	1405	960	795
Abrasion Resistance[7] (Grams Loss per Hour)														
Aged[4] and Unextracted..	60	290	38.4	20.2	15.2	21.5	29.3	52.3	49.9	40.1	55.0	86.7	69.1	102.1
Aged[4] and Extracted[8]...	60	290	50.9	29.8	27.9	33.9	45.2	—	—	—	67.0	116.6	88.4	175.2
Abrasion Resistance Index (EPC = 100)														
Aged and Unextracted...	60	290	100	190	253	179	131	73	77	96	70	44	56	38
Aged and Extracted.....	60	290	100	171	182	150	113	—	—	—	76	44	58	29
Goodrich Flexometer, 30′ Cycle (° F.).....	60	290	261	249	244	—	254	—	—	—	—	—	—	—
Firestone Flexometer, 60′ Cycle (° F.).....	60	290	224	239	236	—	215	—	—	—	—	—	—	—

(1) Polymerized at 41° F. Mooney Viscosity 55. (ML 4′ at 212° F.). (2) ML 4′ at 212° F. (3) MS. (4) 24 hours at 100° C. in air oven. (5) 2.5″ stroke, 0.5″ bend, 300 RPM. (6) 48 hours at 100° C. in air oven. (7) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (8) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

TABLE 8—GR-S X-463[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Philblack-A	Statex-B	Kosmos 40-Dixie 40	Statex-93	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	HAF	VFF	CF	HMF	HMF	FF	HMF	HMF	SRF
Banbury Data												
Maximum Temperature (°F.)	325	330	319	315	310	298	286	317	296	282	291	283
Discharge Temperature (°F.)	295	290	284	278	275	264	278	270	268	253	259	259
Power (Watt-Hours)	1500	1305	1325	1255	1195	1080	1115	1215	1175	1085	1170	1210
Extrusion Rate at 200° F. (Grams per Minute)	3.9	7.3	6.3	6.0	6.9	10.4	9.6	9.2	5.9	7.8	7.4	8.4
Length Shrinkage, Per Cent												
Mill	35	17	25	21	25	6	13	19	35	30	36	40
Extrusion	53	46	53	52	47	35	40	41	52	51	48	47
Polymer Mooney Viscosity[2]	70	70	70	70	70	70	70	70	70	70	70	70
Compound Mooney Viscosity[3]	75	70	70	74	62	68	64	64	55	51	53	51
Difference between Polymer and Compound Viscosity	+5	0	0	+4	—8	—2	—6	—6	—15	—19	—17	—19
Mooney Scorch[2] (Minutes at 250° F.)	33	14	16	25	24	41	28	24	26	42	38	46
Time to Scorch in Tuber (Minutes)												
Tuber Temperature (°F.)												
240	4¼	4¼—	4	4½	4½	8¼	5½	5	5¼—	7½	6¼	7¾
250	4—	4—	3¾	4¼	4+	6½	5—	4½+	4½+	6¼+	5½—	6¾
260	3¾—	3¾—	3½	4	3¾	5½+	4½—	4+	4+	5½	4¾	5¾
270	3½—	3½—	3¼	3¾	3½	4¾+	4	3¾	3¾—	4¾	4¼—	5—
280	3¼—	3¼—	3	3½	3¼	4¼	3¾—	3½—	3½—	4¼	3¾	4¼
290	2¾+	3—	2¾	3¼	3	3¾	3½—	3¼	3¼—	3¾	3½	3¾
Mooney Viscosity[2] of Compound Masticated in Tuber												
Time Masticated (Minutes) / Tuber Temperature (° F.)												
2 240	70.4	68.3	67.2	71.5	59.2	65.9	60.8	63.7	53.7	48.4	—	—
3½ 240	77.8	72.3	72.3	74.3	58.5	64.9	60.3	63.3	52.8	47.8	—	—
4 240	100.0	100.0	—	78.0	60.8	64.9	61.3	64.3	52.2	47.6	52.0	49.8
4½ 240	—	—	—	—	—	65.3	65.0	73.5	53.0	47.4	—	—
6 240	—	—	—	—	—	—	—	—	—	—	56.8	50.0
7 240	—	—	—	—	—	82.4	—	—	—	52.5	—	—
7½ 240	—	—	—	—	—	—	—	—	—	—	—	62.5
2 250	71.4	68.7	67.4	73.2	59.4	65.7	61.1	62.8	53.7	48.8	—	—
3 250	73.5	71.3	68.8	72.8	59.0	65.3	61.2	62.3	53.1	48.3	52.3	49.2
3½ 250	82.0	84.0	100.0	73.3	61.8	65.6	62.4	64.0	53.0	48.0	—	—
4 250	—	—	—	100.0	—	66.0	64.5	69.9	53.8	48.0	52.6	48.8
4½ 250	—	—	—	—	—	67.0	70.6	—	—	48.0	—	—
5 250	—	—	—	—	—	—	—	—	—	—	55.6	49.6
6 250	—	—	—	—	—	76.0	—	—	—	52.1	—	—
6½ 250	—	—	—	—	—	—	—	—	—	—	—	59.2
2 260	71.3	69.0	67.5	73.3	59.4	66.4	60.8	63.2	53.8	49.5	52.7	49.0
3 260	76.2	73.5	76.2	74.7	60.8	66.2	61.2	63.4	53.3	48.6	—	—
3½ 260	—	100.0	—	86.0	100.0	66.5	63.3	68.7	54.2	48.2	—	—
4 260	—	—	—	—	—	67.3	80.5	—	—	48.5	53.4	50.7
4½ 260	—	—	—	—	—	—	—	—	—	—	57.0	51.9
5 260	—	—	—	—	—	83.2	—	—	—	55.3	—	—
5½ 260	—	—	—	—	—	—	—	—	—	—	—	58.3
2 270	72.0	68.0	67.6	73.3	59.2	66.3	60.5	63.7	53.2	48.8	53.1	49.3
2½ 270	72.8	70.9	69.7	73.8	59.8	66.0	60.2	64.0	52.8	48.4	—	—
3 270	85.5	79.4	100.0	77.8	77.8	66.7	61.7	65.0	53.1	48.5	53.7	49.8
4 270	—	—	—	—	—	75.6	—	—	—	52.3	59.3	52.3
4¼ 270	—	—	—	—	—	—	—	—	—	—	—	60.0
2 280	71.4	69.6	68.7	74.0	59.7	67.0	61.5	64.1	53.9	48.7	53.4	49.7
2½ 280	76.8	74.8	77.0	77.0	61.4	67.0	62.7	64.8	54.1	48.2	—	—
3 280	—	100.0	—	91.6	100.0	67.6	66.5	79.5	58.5	48.2	54.0	50.3
3½ 280	—	—	—	—	—	76.0	—	—	—	51.0	57.7	51.5
4 280	—	—	—	—	—	—	—	—	—	—	—	55.3
1½ 290	72.7	69.4	68.9	75.0	59.3	67.7	62.3	63.9	54.2	49.7	52.6	50.7
2 290	73.8	70.5	70.0	76.1	60.0	67.3	61.9	63.9	54.0	49.2	—	—
2½ 290	91.5	78.2	100.0	80.4	75.8	67.7	62.4	67.1	54.1	51.3	54.9	50.8
3 290	—	—	—	100.0	—	69.5	72.4	100.0	—	70.5	—	—
3¼ 290	—	—	—	—	—	—	—	—	—	—	61.3	52.4
3½ 290	—	—	—	—	—	—	—	—	—	—	—	55.7

TABLE 8—GR-S X-463 (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Vulcan	Statex-K
Type			EPC	RF	HAF	HAF	VFF
	Curing Time (Min.)	Temp. (° F.)					
Unaged							
Modulus at 300% Elongation	15	290	430	1200	1020	400	710
(Lbs./Sq. In.)	30	290	1130	2130	1950	1200	1530
	45	290	1460	2530	2330	1620	1850
	60	290	1700	2700	2530	1870	1980
Tensile Strength	15	290	3250	3530	3830	2260	3670
(Lbs./Sq. In.)	30	290	4580	3970	4030	3720	4210
	45	290	4420	3920	4250	3950	3960
	60	290	4060	3850	4130	3880	3840
Per Cent Elongation at Break	15	290	935	660	660	845	850
	30	290	670	500	475	650	600
	45	290	580	420	450	560	515
	60	290	510	400	420	510	485
Hardness, Shore Durometer	15	290	58	63	61	55	60
(Inches × 10^3)	30	290	62	66	64	60	63
	45	290	65	68	65	62	65
	60	290	66	69	66	64	66
Aged [4]							
Modulus at 200% Elongation	15	290	1080	2060	1670	—	1650
(Lbs./Sq. In.)	30	290	1330	2290	2030	—	1720
	45	290	1290	2130	1800	—	1490
	60	290	1290	2000	1650	—	1380
Tensile Strength	15	290	2700	3440	3400	—	3100
(Lbs./Sq. In.)	30	290	3100	3600	3700	—	3420
	45	290	3540	3680	3870	—	3720
	60	290	3500	3680	3870	—	3610
Per Cent Elongation at Break	15	290	380	315	325	—	330
	30	290	375	300	310	—	340
	45	290	415	325	335	—	400
	60	290	415	340	350	—	410
Hardness, Shore Durometer	15	290	66	70	69	—	69
(Inches × 10^3)	30	290	68	71	70	—	69
	45	290	69	71	70	—	70
	60	290	69	70	68	—	68
Flex (De Mattia), Cut Growth to Failure [5] (Flexes)							
Unaged	60	290	2515	990	3920	—	2660
Aged [6]	60	290	675	502	525	—	805
Abrasion Resistance [7] (Grams Loss per Hour)							
Aged [4] and Unextracted	60	290	20.5	17.8	16.3	25.6	28.3
Aged [4] and Extracted [8]	60	290	30.9	21.1	23.1	26.8	34.5
Abrasion Resistance Index (EPC = 100)							
Aged and Unextracted	60	290	100	115	126	80	72
Aged and Extracted	60	290	100	146	134	115	90
Goodrich Flexometer, 30′ Cycle (° F.)	60	290	189	199	192	—	195
Firestone Flexometer, 60′ Cycle (° F.)	60	290	210	211	206	—	194

(1) Polymerized at 14° F. Mooney Viscosity 70. (ML 4′ at 212° F.). (2) ML 4′ at 212° F. (3) MS. (4) 24 hours at 100° C. in air oven. (5) 2.5″ stroke, 0.5″ bend, 300 RPM. (6) 48 hours at 100° C. in air oven. (7) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (8) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

lowing discussion the comparative ratings of the polymers and of the carbon blacks.

Rating of X-485 (41° F. and 55 Mooney) against GR-S-10 (122° F. and 53 Mooney)

These two polymers were made at different reaction temperatures with different modifiers and short-stops. Their viscosities are practically alike (53 versus 55). Comparing the processing data of the two polymers, compounded with various carbon blacks, it is observed that the X-485 stocks consumed less power and that they, in general, mixed hotter, were more scorchy, shrank less, extruded at a higher rate, and were higher in viscosity.

The power consumption of the X-485 stocks was from 1 to 11 per cent lower, depending upon the carbon black. This may have been due partly to the fact that they were compounded with twice (12 parts) the amount of softener used with the GR-S-10 stocks. However, four of the X-485 carbon black stocks mixed 4° F. cooler, and eight mixed from 1° to 27° F. hotter. The extrusion rate at 200° F., through a 3/64-inch die, was

TABLE 9—GR-S X-464—38 MOONEY[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Statex-B	Kosmos 40-Dixie 40	Kosmos 20-Dixie 20
Type	EPC	RF	HAF	VFF	CF	HMF	FF	HMF	SRF
Banbury Data									
Maximum Temperature (°F.)	288	300	288	270	288	280	259	258	258
Discharge Temperature (°F.)	261	267	263	253	279	264	238	238	241
Power (Watt-Hours)	1140	1140	1190	1180	1150	1100	1070	1055	1090
Extrusion Rate at 200° F. (Grams per Minute)	5.5	9.6	8.4	7.5	10.7	10.6	7.4	8.0	8.1
Length Shrinkage, Per Cent									
Mill	24	7	9	12	5	7	17	17	20
Extrusion	52	38	45	44	32	36	48	48	48
Polymer Mooney Viscosity[2]	38	38	38	38	38	38	38	38	38
Compound Mooney Viscosity[2]	57	55	55	47	59	51	40	41	38
Difference between Polymer and Compound Viscosity	+19	+17	+17	+9	+21	+13	+2	+3	0
Mooney Scorch[3] (Minutes at 250° F.)	38	19	26	31	23	24	30	40	39
Time to Scorch in Tuber (Minutes)									
Tuber Temperature (°F.)									
240	5¾	6¼	5½	7¼	9+	7½	8½	10	11
250	5¼	5¼+	5—	6	7¼	6+	6¾	8	9+
260	4¾	4¾	4½	5¼	5¾+	5+	5½	6½+	7¼+
270	4½—	4¼	4+	4½+	4¾+	4¼+	4¾	5½	6—
280	4	3¾+	3¾	4+	4¼+	4	4¼	4¾	4¾+
290	3½+	3½	3¼+	3¾	3¾+	3¾+	4	4+	4¼
Mooney Viscosity[2] of Compound Masticated in Tuber									
Time Masticated (Minutes) / Tuber Temperature (° F.)									
3 240	54.6	54.3	54.6	47.0	57.2	49.6	40.3	40.5	—
4 240	—	—	—	—	—	—	—	—	38.3
4½ 240	54.5	55.3	55.8	48.1	57.8	51.1	40.4	40.4	—
5 240	55.1	56.7	57.8	48.7	58.7	52.0	40.5	40.4	—
6 240	—	100.0	—	51.0	61.6	55.3	41.1	40.7	39.0
7½ 240	—	—	—	—	—	—	—	—	39.5
8 240	—	—	—	—	79.4	—	50.4	41.9	—
9 240	—	—	—	—	—	—	—	43.1	40.3
10 240	—	—	—	—	—	—	—	—	42.2
11 240	—	—	—	—	—	—	—	—	78.0
3 250	54.5	54.4	54.5	47.0	57.3	50.3	41.3	40.7	37.8
4 250	—	—	—	—	—	—	—	—	38.2
4½ 250	57.8	55.3	59.0	47.8	61.3	55.8	42.5	40.7	—
5 250	—	—	—	—	—	—	—	—	38.7
5½ 250	—	—	—	51.4	68.5	64.6	43.6	40.8	—
6½ 250	—	—	—	—	79.2	—	47.6	41.7	39.7
7½ 250	—	—	—	—	—	—	—	45.3	—
8 250	—	—	—	—	—	—	—	—	42.5
9 250	—	—	—	—	—	—	—	—	71.0
2 260	—	—	—	—	—	—	—	—	37.8
3 260	55.1	54.9	53.8	47.8	59.0	51.4	41.6	40.6	—
4 260	56.1	59.9	60.1	49.1	59.5	52.0	42.4	40.8	39.0
4½ 260	100.0	100.0	100.0	51.3	61.0	53.8	43.0	40.9	39.6
5 260	—	—	—	100.0	66.0	—	44.9	41.2	—
5½ 260	—	—	—	—	—	—	—	—	41.3
6 260	—	—	—	—	—	—	—	51.0	—
7 260	—	—	—	—	—	—	—	—	48.3
2 270	55.3	55.0	54.6	47.7	58.9	50.7	40.6	40.6	38.2
3 270	—	—	—	—	—	—	—	—	38.8
3½ 270	56.1	59.5	57.5	48.8	59.5	51.1	41.3	40.8	—
4 270	60.5	100.0	100.0	51.0	59.8	59.5	42.0	41.0	39.7
4½ 270	—	—	—	—	65.5	—	45.0	41.4	—
4¾ 270	—	—	—	—	—	—	—	—	40.8
5 270	—	—	—	—	—	—	—	43.2	—
5¾ 270	—	—	—	—	—	—	—	—	58.0
2 280	56.0	54.1	55.5	47.3	57.7	49.9	40.5	39.5	38.7
3 280	56.2	56.6	63.4	49.0	59.0	51.4	41.5	39.0	39.4
3½ 280	60.3	—	100.0	53.3	64.0	58.0	43.4	39.8	40.0
4 280	—	—	—	68.2	79.1	100.0	48.2	44.1	41.8
4¼ 280	—	—	—	—	—	—	—	—	73.0
1½ 290	55.0	55.0	54.2	45.2	57.9	49.3	39.0	39.7	38.7
2½ 290	56.5	55.7	56.2	48.8	59.5	51.0	41.0	40.4	39.3
3 290	59.5	60.1	65.5	53.5	65.5	54.2	43.8	40.8	—
3¼ 290	—	—	—	—	—	—	—	—	40.2
3½ 290	—	—	—	100.0	83.0	82.3	50.5	44.5	40.8
4 290	—	—	—	—	—	—	—	—	44.9

TABLE 9—GR-S X-464—38 MOONEY (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Statex-K
Type			EPC	RF	HAF	VFF
	Curing Time (Min.)	Temp. (° F.)				
Unaged						
Modulus at 300% Elongation (Lbs./Sq. In.)	15	290	370	930	880	600
	30	290	890	1750	1670	1300
	45	290	1230	2160	2070	1590
	60	290	1380	2370	2220	1730
Tensile Strength (Lbs./Sq. In.)	15	290	3070	2860	3450	3220
	30	290	4300	3560	3930	3970
	45	290	4180	3680	4120	3770
	60	290	3940	3680	4020	3650
Per Cent Elongation at Break	15	290	950	765	735	885
	30	290	725	560	560	675
	45	290	620	485	490	570
	60	290	575	440	460	525
Hardness, Shore Durometer (Inches × 10^3)	15	290	60	63	62	60
	30	290	64	67	66	64
	45	290	67	69	67	66
	60	290	68	70	68	67
Aged[4]						
Modulus at 200% Elongation (Lbs./Sq. In.)	15	290	690	1920	1610	1430
	30	290	1000	1960	1700	1480
	45	290	1130	1960	1650	1360
	60	290	1130	1820	1610	1280
Tensile Strength (Lbs./Sq. In.)	15	290	3380	3320	3480	3000
	30	290	3380	3380	3680	3140
	45	290	3380	3510	3680	3280
	60	290	3380	3510	3660	3280
Per Cent Elongation at Break	15	290	610	335	350	370
	30	290	515	335	360	375
	45	290	460	350	350	410
	60	290	460	375	360	420
Hardness, Shore Durometer (Inches × 10^3)	15	290	66	71	70	70
	30	290	69	72	70	70
	45	290	70	72	70	70
	60	290	70	72	70	69
Flex (De Mattia), Cut Growth to Failure[6] (Flexes)						
Unaged	60	290	3278	3685	5493	2895
Aged[4]	60	290	1355	725	512	500
Abrasion Resistance[7] (Grams Loss per Hour)						
Aged[4] and Unextracted	60	290	23.8	20.9	16.1	27.3
Aged[4] and Extracted[5]	60	290	31.8	29.2	19.5	49.3
Abrasion Resistance Index (EPC = 100)						
Aged and Unextracted	60	290	100	114	148	87
Aged and Extracted	60	290	100	109	163	65
Goodrich Flexometer, 30′ Cycle (° F.)	60	290	206	209	203	204
Firestone Flexometer, 60′ Cycle (° F.)	60	290	218	214	211	211

(1) Polymerized at 0° F. Mooney Viscosity 38. (ML 4′ at 212° F.). (2) ML 4′ at 212° F. (3) MS. (4) 24 hours at 100° C. in air oven. (5) 2.5″ stroke, 0.5″ bend, 300 RPM. (6) 48 hours at 100° C. in air oven. (7) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (8) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

from 30 to 100 per cent greater, depending upon the carbon black. The stocks, when tubed at 250° F. through a 3/64-inch die, scorched from 1 to 11 minutes quicker, depending upon the carbon black. The Mooney scorch time at this temperature was from 5 to 23 minutes less. With the exception of the channel black stock, which shrank 8 per cent more, the length shrinkage of the eleven furnace black mill stocks was from 3 to almost 15 per cent less, depending upon the carbon black.

The viscosity of the X-485 stocks increased at a more rapid rate than that of the GR-S-10 stocks upon prolonged mastication in the tuber. For instance, when the mastication was at 250° F., the viscosity curves for the X-485 stocks rose sharply a third to half the time sooner than was experienced with the GR-S-10 stocks. A rise in the viscosity curve signalizes that the stock is on the verge of scorching.

As shown in Figure 32, several remillings of X-485 stock, containing Kosmos 60-Dixie 60, did not bring about the same reduction in viscosity that was achieved with similar remilling of GR-S-10 stock.

The viscosity of the X-485 stocks ranged from 48

TABLE 10—GR-S X-464—42 MOONEY[1]

Processing Characteristics

Carbon Black	Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Statex-K	Acetylene (Shawinigan)	Kosmos 50-Dixie 50	Statex-B	Kosmos 40-Dixie 40
Type	EPC	RF	HAF	VFF	CF	HMF	FF	HMF
Banbury Data								
Maximum Temperature (°F.)	286	299	290	272	292	278	260	250
Discharge Temperature (°F.)	263	266	260	252	280	270	239	236
Power (Watt-Hours)	1205	1130	1160	1135	1145	1130	1080	1050
Extrusion Rate at 200° F. (Grams per Minute)	6.0	9.7	9.3	8.5	10.8	10.3	7.1	8.4
Length Shrinkage, Per Cent								
Mill	25	7	9	9	8	10	17	15
Extrusion	51	37	44	43	32	36	49	48
Polymer Mooney Viscosity[2]	42	42	42	42	42	42	42	42
Compound Mooney Viscosity[2]	55	55	51	43	57	50	38	35
Difference between Polymer and Compound Viscosity	+13	+13	+9	+1	+15	+8	—4	—7
Mooney Scorch[3] (Minutes at 250° F.)	38	25	24	28	34	32	30	37
Time to Scorch in Tuber (Minutes)								
Tuber Temperature (° *F.*)								
240	6	6+	6	8	9	8	9¼	11¾+
250	5½—	5¼	5¼	6¾—	7½—	6½	7¾—	9½—
260	4¾	4¾—	4¾—	5¾	6¼—	5½—	6½—	7½
270	4¼+	4¼—	4¼—	5	5¼	4½+	5½—	6
280	4—	3¾	3¾	4½—	4½	4+	4¾—	5—
290	3¾	3¼+	3½	4—	4	3¾	4+	4¼
Mooney Viscosity[2] of Compound Masticated in Tuber								
Time Masticated (Minutes) / Tuber Temperature (° F.)								
3 / 240	53.2	54.0	50.0	43.8	55.8	49.7	39.0	36.5
5 / 240	53.9	58.2	52.5	45.4	56.8	49.7	39.7	37.3
6 / 240	—	—	—	46.8	58.4	51.8	40.0	37.8
7 / 240	—	—	—	49.1	62.2	60.5	40.5	38.1
8½ / 240	—	—	—	—	80.0	—	44.8	39.4
11 / 240	—	—	—	—	—	—	—	49.1
3 / 250	53.0	54.3	49.6	44.5	56.8	49.0	39.2	36.2
4½ / 250	54.3	58.9	53.9	45.8	56.8	49.9	39.4	37.2
5½ / 250	—	—	—	47.3	60.1	54.9	39.7	38.3
7 / 250	—	—	—	—	91.1	—	45.0	40.7
8½ / 250	—	—	—	—	—	—	—	45.2
2 / 260	53.2	54.7	50.4	43.4	57.4	50.0	38.2	36.0
4 / 260	54.8	59.5	53.7	45.4	58.1	50.6	38.9	37.5
4½ / 260	100.0	—	—	47.2	59.9	52.3	39.1	38.0
5 / 260	—	—	—	49.9	65.0	70.8	39.6	38.5
6 / 260	—	—	—	—	—	—	65.2	39.6
7 / 260	—	—	—	—	—	—	—	68.0
2 / 270	52.3	55.3	50.5	43.8	56.8	50.0	38.9	36.8
3½ / 270	55.8	59.0	55.8	45.0	58.1	50.4	39.6	38.2
4 / 270	75.0	—	—	46.3	62.2	53.3	40.4	38.7
4½ / 270	—	—	—	60.0	72.2	—	43.0	39.2
5½ / 270	—	—	—	—	—	—	—	47.3
2 / 280	54.0	55.0	50.2	43.3	57.4	50.0	39.3	36.8
3 / 280	54.0	57.3	52.4	44.3	58.9	51.1	40.0	37.7
3½ / 280	58.0	100.0	100.0	46.7	64.9	57.1	40.8	38.1
4 / 280	—	—	—	57.0	79.3	—	43.6	39.4
2 / 290	53.9	55.0	51.7	45.1	57.1	50.2	39.4	37.4
3 / 290	56.1	79.9	61.0	47.2	62.3	54.8	40.8	38.7
3½ / 290	100.0	—	—	57.3	80.0	100.0	44.5	39.3

TABLE 10—GR-S X-464—42 MOONEY (Continued)

Reinforcement Characteristics

Carbon Black			Kosmobile 77-Dixiedensed 77	Kosmos 60-Dixie 60	Philblack-O	Statex-K
Type			EPC	RF	HAF	VFF
	Curing Time (Min.)	Temp. (° F.)				
Unaged						
Modulus at 300% Elongation (Lbs./Sq. In.)	15	290	310	740	650	520
	30	290	880	1730	1630	1340
	45	290	1230	2150	2050	1660
	60	290	1420	2280	2300	1840
Tensile Strength (Lbs./Sq. In.)	15	290	2800	2570	2980	2780
	30	290	3860	3530	3820	3570
	45	290	3740	3530	4100	3670
	60	290	3680	3370	3880	3500
Per Cent Elongation at Break	15	290	1035	785	775	900
	30	290	700	560	540	630
	45	290	610	465	510	560
	60	290	540	415	440	500
Hardness, Shore Durometer (Inches × 10^3)	15	290	55	60	58	54
	30	290	64	66	64	61
	45	290	65	68	66	64
	60	290	67	69	67	64
Abrasion Resistance[4] (Grams Loss per Hour)						
Aged[5] and Unextracted	60	290	24.6	26.7	21.9	28.2
Aged[5] and Extracted[6]	60	290	30.3	33.2	—	—
Abrasion Resistance Index (EPC = 100)						
Aged and Unextracted	60	290	100	92	112	87
Aged and Extracted	60	290	100	91	—	—

(1) Polymerized at 0° F. Mooney Viscosity 42. (ML 4' at 212° F.). (2) ML 4' at 212° F. (3) MS. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

to 71, depending upon the carbon black, whereas that of the GR-S-10 stocks ranged from 40 to 58.

Rating of X-463 (14° F. and 70 Mooney) against GR-S-10 (122° F. and 53 Mooney)

These two polymers were made at different reaction temperatures and with different short-stops and emulsifiers. Their viscosities are quite different. Comparing the processing data of the two polymers, compounded with various carbon blacks, it is evident that the X-463 stocks consumed less power, mixed hotter, were more scorchy, extruded at a lower rate, shrank less, and were higher in viscosity.

Ten X-463 carbon black stocks required from 2 to 14 per cent less power, and two required from 3 to 12 per cent more. Ten carbon black stocks mixed from 4° to 17° F. hotter, and two mixed from 7° to 10° F. cooler. When tubed at 250° F. through a 3/64-inch die, the X-463 stocks scorched from 2 to 14¼ minutes faster, depending upon the carbon black. The Mooney scorch time at the same temperature was from 22 to 57 minutes less, depending upon the carbon black. The X-463 stocks containing the furnace blacks shrank from 3 to 16 per cent less, depending upon the carbon black. The channel black stock shrank 1 per cent more. The extrusion rate of eight of the X-463 stocks at 200° F., through a 3/64-inch die, was from 2 to 39 per cent less, depending upon the carbon black. However, for one stock it remained unchanged, and for three stocks it was from 2 to 22 per cent greater.

The viscosity of the X-463 stocks increased at a more rapid rate than that of the GR-S-10 stocks upon prolonged mastication in the tuber. Thus, when the mastication was at 250° F., the viscosity curves for the X-463 stocks rose sharply from almost a half to three-fourths of the time sooner than was experienced with the GR-S-10 stocks. A sharp rise in the viscosity curve indicates that the stock is about to scorch.

The viscosity of the X-463 stocks ranged from 51 to 75, depending upon the carbon black; that of the GR-S-10 stocks ranged from 40 to 58.

Rating of X-464 (0° F. and 38 Mooney) against GR-S-10 (122° F. and 53 Mooney)

The manufacturing conditions for these two polymers were different with respect to reaction temperatures, short-stops, and emulsifiers. There is a marked difference in their viscosities. Comparing the processing data of the two polymers, compounded with various carbon blacks, it is clear that the X-464 stocks consumed less power, mixed cooler, were more scorchy, and shrank less. The extrusion rate was slightly less for the stocks containing carbon black of high reinforcement and greater for the stocks containing less reinforcing carbon black. The viscosity of the X-464 stocks reached approximately the same levels as were reached by the GR-S-10 stocks.

The power consumption for the X-464 stocks decreased from 8 to 16 per cent, depending upon the carbon black. The stocks mixed from 16° to 34° cooler. When tubed at 250° F. through a 3/64-inch die, the X-464 stocks scorched from 1 to 12 minutes quicker. The Mooney scorch time at this temperature was from 12 to 64 minutes less, depending upon the carbon black. The X-464 stocks shrank from 10 to 29 per cent less, also depending upon the carbon black. The extrusion

TABLE 11—KOSMOBILE 77-DIXIEDENSED 77

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	262	312	320	308	325	288	286
Banbury, Power (Watt-Hours)	1130	1345	1360	1310	1500	1140	1205
Extrusion Rate at 200° F. (Grams per Minute)	10.7	6.4	6.6	8.6	3.9	5.5	6.0
Per Cent Shrinkage, Mill	26	34	42	42	35	24	25
Per Cent Shrinkage, Extrusion	53	50	53	55	53	52	51
Polymer Viscosity [1]	80	53	67	55	70	38	42
Compound Viscosity [1]	55	57	77	64	75	57	55
Tuber Scorch at 250° F. (Minutes)	3½+	8¾	3¾	4¾+	4—	5¼	5½—
Mooney Scorch MS at 250° F. (Minutes)	23	79	35	56	33	38	38
300% Modulus, Optimum Cure (PSI)	1280	1140	1270	970	1700	1380	1230
Tensile Strength at Break, Optimum Cure (PSI)	4500	2930	4520	4180	4060	3940	3740
Per Cent Elongation at Break, Optimum Cure	645	560	630	700	510	575	610
Shore Hardness, Optimum Cure (Inches × 10²)	62	58	61	58	66	68	65
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]							
Unaged	20795	2575	2240	3680	2515	3278	—
Aged [3]	4020	2845	1440	1585	675	1355	—
Abrasion Resistance (Grams Loss per Hour) [4]							
Aged [5] and Unextracted	41.8	28.3	33.9	38.4	20.5	23.8	24.6
Aged [5] and Extracted [6]	55.5	40.2	38.7	50.9	30.9	31.8	30.3
Goodrich Flexometer, 30' Cycle, 60' Cure (° F.)	—	291	234	261	189	206	—
Firestone Flexometer, 60' Cycle, 60' Cure (° F.)	—	244	224	224	210	218	—

(1) ML 4' at 212° F. (2) 2.5" stroke, 0.5" bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

rate at 200° F., through a 3/64-inch die, was from 7 to 19 per cent less for the stocks containing high reinforcing carbon black and from 5 to 25 per cent greater for the stocks containing less reinforcing carbon black.

The viscosity of the X-464 stocks increased at a more rapid rate than that of the GR-S-10 stocks upon prolonged mastication in the tuber. For instance, when the mastication was at 260° F., the viscosity curves for the X-464 stocks rose sharply a fifth to less than half the time sooner than was experienced with the GR-S-10 stocks. A sharp rise in the viscosity curve indicates that the stock is on the verge of scorching.

Considering the difference in the viscosity of the two polymers, it should be noted that the viscosity of the X-464 stocks did not fall below 38 and reached a high of 59, as against the viscosity of 38 for the X-464 polymer. On the other hand, the viscosity of the GR-S-10 stocks reached a minimum of 40 and a high of 58, as against the viscosity of 53 for the GR-S-10 polymer.

Rating of X-485 (41° F. and 55 Mooney) against X-435 (41° F. and 67 Mooney)

These two polymers were made with different short-stops, and the reactions were controlled to give X-435 a viscosity of 67 and X-485 a viscosity of 55. Comparing the processing data of the two polymers, compounded with various carbon blacks, it is evident that the X-485 stocks consumed less power, mixed cooler, were less scorchy, shrank less, extruded at a higher rate, and were lower in viscosity.

The power consumption for eleven of the X-485 carbon black stocks ranged from 1 to 13 per cent lower, depending upon the carbon black, and for one it was 4 per cent higher. The temperatures were from 1° to 21° F. cooler for eight of the X-485 carbon black stocks, from 6° to 14° hotter for three, and unchanged for one.

The extrusion rate at 200° F., through a 3/64-inch die, was from 1 to 39 per cent greater for six carbon black stocks, from 3 to 16 per cent less for five, and unchanged for one. X-485 stocks, when tubed at 250° F. through a 3/64-inch die, took from 1 to 3 minutes longer to scorch, depending upon the carbon black. The Mooney scorch time at this temperature was from 9 to 31 minutes more, also depending upon the carbon black. The shrinkage of ten of the X-485 carbon black stocks was from 4 to 15 per cent less, depending upon the carbon black; one remained unchanged; and the other rose 7 per cent.

The viscosity of the X-485 stocks increased at a less rapid rate than that of the X-435 stocks upon prolonged mastication in the tuber. Thus, if the mastication was at 250° F., the viscosity curves for the X-485 stocks rose sharply in almost half the time experienced with the X-435 stocks. As previously pointed out, a sharp rise in the viscosity curve signifies that the stock will soon scorch.

The remilling of the X-485 stock, compounded with Kosmos 60-Dixie 60, produced less changes in viscosity than was experienced with the remilling of X-435 similarly compounded. Thus, as shown in Figure 32, ten remillings of the X-485 stock reduced the viscosity but 15 points, whereas the same remillings of the X-435 stock lowered the viscosity 20 points.

The viscosity of the X-485 stocks reached a high of 71 and a low of 48, depending upon the carbon black. This was in contrast with the viscosity of 55 for the polymer. On the other hand, the viscosity of the X-435 stocks reached a high of 77 and a low of 53, in contrast with the viscosity of 70 for the polymer.

TABLE 12—KOSMOS 60-DIXIE 60

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	314	319	337	323	330	300	299
Banbury, Power (Watt-Hours)	1270	1360	1320	1230	1305	1140	1130
Extrusion Rate at 200° F. (Grams per Minute)	8.9	11.8	15.0	15.0	7.3	9.6	9.7
Per Cent Shrinkage, Mill	14	20	22	17	17	7	7
Per Cent Shrinkage, Extrusion	46	40	43	41	46	38	37
Polymer Viscosity[1]	80	53	67	55	70	38	42
Compound Viscosity[1]	55	55	78	67	70	55	55
Tuber Scorch at 250° F. (Minutes)	3+	6½—	3¼+	4¾	4—	5¼+	5¼
Mooney Scorch MS at 250° F. (Minutes)	9	43	21	30	14	19	25
300% Modulus, Optimum Cure (PSI)	2190	2070	2160	1780	2700	2370	2150
Tensile Strength at Break, Optimum Cure (PSI)	3880	2970	3970	3770	3850	3680	3530
Per Cent Elongation at Break, Optimum Cure	475	410	490	560	400	440	465
Shore Hardness, Optimum Cure (Inches × 10^3)	64	62	66	62	69	70	68
Flex, De Mattia, Cut Growth to Failure (Flexes)[2]							
Unaged	67310	1935	3835	2700	990	3685	—
Aged[3]	1865	1243	1370	952	502	725	—
Abrasion Resistance Index (EPC = 100)[4]							
Aged[5] and Unextracted	205	161	163	190	115	114	92
Aged[5] and Extracted[6]	155	167	145	171	146	109	91
Goodrich Flexometer, 30′ Cycle, 60′ Cure (° F.)	—	259	240	249	199	209	—
Firestone Flexometer, 60′ Cycle, 60′ Cure (° F.)	—	243	238	239	211	214	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

Rating of X-463 (14° F. and 70 Mooney) against X-485 (41° F. and 55 Mooney)

These two polymers were produced at different reaction temperatures with different modifiers and different emulsifiers. They differ considerably in viscosity. Comparing the processing data of each polymer, compounded with various carbon blacks, it is obvious that, in general, the X-463 stocks consumed more power, mixed hotter, were more scorchy, shrank very little, if any, and extruded at a lower rate. In spite of the higher viscosity of the X-463 polymer, the viscosity of its stocks was not much higher than the viscosity of the X-485 stocks containing carbon black of moderate reinforcement.

A review of the processing data indicates that nine of the X-463 stocks consumed from 2 to 15 per cent more power and that three required from 2 to 5 per cent less. Seven of the X-463 stocks mixed from 3° to 17° F. hotter; four, from 4° to 35° F. cooler; and one, at the same temperature. The X-463 stocks, when tubed at 250° F. through a 3/64-inch die, scorched from ¼ to 3½ minutes sooner. The Mooney scorch time at this temperature was from 9 to 43 minutes less, depending upon the carbon black. The extrusion rate at 200° F., through a 3/64-inch die, was from 28 to 60 per cent less, depending upon the carbon black. Four of the X-463 stocks shrank from 1 to 9 per cent more; five shrank from 1 to 7 per cent less; and three remained unchanged.

The viscosity of the X-463 stocks increased at a more rapid rate than that of the X-485 stocks upon prolonged mastication in the tuber. Thus, when the mastication was at 250° F., the viscosity curves for the X-463 stocks rose sharply from a tenth to a little less than a third of the time sooner than was experienced with the X-485 stocks. A sharp rise in the viscosity curve was an indication that the stock was approaching a scorch point.

The viscosity of the X-463 stocks ranged from a low of 51 to a high of 75, depending upon the carbon black; that of the X-485 stocks ranged from a low of 48 to a high of 71.

Rating of X-463 (14° F. and 70 Mooney) against X-435 (41° F. and 67 Mooney)

These two polymers were made at different reaction temperatures with different modifiers and emulsifiers and with only three points difference in viscosity. Comparing the processing data of the two polymers, compounded with various carbon blacks, it is evident that the X-463 stocks, in general, required less power, mixed cooler, were slightly more scorchy, shrank less, extruded at a lower rate, and were somewhat lower in viscosity.

Eight X-463 carbon black stocks consumed from 1 to 8 per cent less power; three consumed from 4 to 10 per cent more; and one remained unchanged. Ten X-463 stocks mixed from 1° to 29° F. cooler, and two mixed 3° and 5° F. hotter, respectively. When tubed at 250° F. through a 3/64-inch die, five X-463 stocks scorched from ¼ to ¾ minute slower; six scorched from ¼ to ½ minute faster; and one remained unchanged. The Mooney scorch time at this temperature for ten X-463 carbon black stocks ranged from 1 to 12 minutes less, and was unchanged for two. Ten of the X-463 stocks shrank from 4 to 19 per cent less, and two shrank 4 per cent more. The extrusion rate of the X-463 stocks at 250° F., through a 3/64-inch die, was from 31 to 51 per cent less, depending upon the carbon black.

The viscosity of the X-463 stocks containing highly reinforcing black did not increase as rapidly as that of

TABLE 13—PHILBLACK-0

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	288	314	331	310	319	288	290
Banbury, Power (Watt-Hours)	1230	1405	1380	1290	1325	1190	1160
Extrusion Rate at 200° F. (Grams per Minute)	7.9	9.4	10.8	13.4	6.3	8.4	9.3
Per Cent Shrinkage, Mill	21	28	40	25	25	9	9
Per Cent Shrinkage, Extrusion	46	45	53	47	53	45	44
Polymer Viscosity[1]	80	53	67	55	70	38	42
Compound Viscosity[1]	60	55	74	63	70	55	51
Tuber Scorch at 250° F. (Minutes)	3¼+	6+	3¾	5	3¾	5—	5¼
Mooney Scorch MS at 250° F. (Minutes)	11	38	20	30	16	26	24
300% Modulus, Optimum Cure (PSI)	1920	1740	1930	1510	2530	2220	2050
Tensile Strength at Break, Optimum Cure (PSI)	3960	3130	4340	4060	4130	4020	4100
Per Cent Elongation at Break, Optimum Cure	510	450	520	575	420	460	510
Shore Hardness, Optimum Cure (Inches × 10^3)	61	60	62	61	66	68	66
Flex, De Mattia, Cut Growth to Failure (Flexes)[2]							
Unaged	75835	2100	3080	3845	3920	5493	—
Aged[3]	2329	3958	1792	2578	525	512	—
Abrasion Resistance Index (EPC = 100)[4]							
Aged[5] and Unextracted	179	190	219	253	126	148	112
Aged[5] and Extracted[6]	173	131	150	182	134	163	—
Goodrich Flexometer, 30′ Cycle, 60′ Cure (° F.)	—	260	234	244	192	203	—
Firestone Flexometer, 60′ Cycle, 60′ Cure (° F.)	—	235	230	236	206	211	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

the X-435 stocks similarly compounded, upon prolonged mastication in the tuber. For instance, when the mastication was at 250° F., the viscosity curves for the X-463 stocks took about one-fourth the time longer to rise sharply than was experienced with the X-435 stocks. The sharp rise in the viscosity curve was a warning that the stocks were about to scorch.

The X-463 stocks reached a viscosity ranging from a low of 51 to a high of 75, depending upon the carbon black, as against a low of 53 and a high of 78 for the X-435 stocks.

Rating of X-464 (0° F. and 38 Mooney) against X-485 (41° F. and 55 Mooney)

These two polymers were obtained at different reaction temperatures with different modifiers, short-stops, and emulsifiers. The resulting viscosities were different. Comparing the processing data of each polymer, compounded with various carbon blacks, it is noted that the X-464 stocks generally consumed less power, mixed cooler, were less scorchy, extruded at a lower rate, shrank less, and were lower in viscosity.

Ten of the X-464 stocks consumed from 3 to 13 per cent less power, and two required 3 per cent more. The stocks mixed from 20° to 45° F. hotter, depending upon the carbon black. When tubed at 250° F. through a 3/64-inch die, five of the X-464 carbon black stocks scorched in a fraction of a minute more, and two in about a minute and a half less. However, the Mooney scorch time at this temperature for all the stocks was from 4 to 50 minutes less, depending upon the carbon black. The shrinkage of the X-464 stocks was from 4 to 23 per cent less. The extrusion rate of the X-464 stocks at 250° F., through a 3/64-inch die, was from 30 to 43 per cent less, depending upon the carbon black.

The viscosity of the X-464 stocks containing highly reinforcing carbon black increased at a slower rate in comparison with the X-485 stocks similarly compounded, upon prolonged mastication in the tuber. For instance, when the mastication was at 260° F., the viscosity curves for the X-464 stocks took about one-tenth the time longer to rise sharply than was experienced with the X-485 stocks.

The viscosity of the X-464 stocks ranged from 38 to 59, whereas that of the X-485 stocks ranged from 48 to 71.

Rating of X-464 (0° F. and 38 Mooney) against X-463 (14° F. and 70 Mooney)

These two polymers were made at different reaction temperatures with the same modifier, short-stop, and emulsifier. X-463 had a much higher viscosity than X-464. Comparing the processing data of the two polymers, compounded with various carbon blacks, it is noted that the X-464 stocks consumed less power, mixed cooler, were more scorchy, extruded at a faster rate, shrank less, and were lower in viscosity.

Eight of the X-464 stocks required from 1 to 2½ per cent less power, and one required 7 per cent more. The X-464 stocks mixed from 6° to 40° F. cooler, depending upon the carbon black. When tubed at 250° F. through a 3/64-inch die, the X-464 stocks scorched from 1 to 2 minutes faster. However, the Mooney scorch time at this same temperature was from 5 to 10 minutes more for four of the stocks and from 2 to 18 minutes less for five. The X-464 stocks shrank from 6 to 20 per cent less, depending upon the carbon black. The extrusion rate at 250° F., through a 3/64-inch die, was from 3 to 41 per cent greater for eight of the stocks and 4 per cent less for one.

The viscosity of the X-464 stocks did not increase as rapidly as that of the X-463 stocks upon prolonged

TABLE 14—VULCAN

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	302	310	320	307	315	—
Banbury, Power (Watt-Hours)	1270	1330	1360	1190	1255	—
Extrusion Rate at 200° F. (Grams per Minute)	8.9	9.3	13.2	14.9	6.0	—
Per Cent Shrinkage, Mill	15	25	33	19	21	—
Per Cent Shrinkage, Extrusion	49	43	47	45	52	—
Polymer Viscosity [1]	80	53	67	55	70	42
Compound Viscosity [1]	58	56	77	67	74	—
Tuber Scorch at 250° F. (Minutes)	3	7½+	4½	5¾	4¼	—
Mooney Scorch MS at 250° F. (Minutes)	10	47	25	38	25	—
300% Modulus, Optimum Cure (PSI)	1730	1600	1420	1100	1870	1540
Tensile Strength at Break, Optimum Cure (PSI)	3560	3130	3670	3400	3880	3640
Per Cent Elongation at Break, Optimum Cure	515	490	610	680	510	600
Shore Hardness, Optimum Cure (Inches × 10^3)	61	59	60	57	64	64
Abrasion Resistance Index (EPC = 100) [2]						
Aged [3] and Unextracted	155	143	171	179	80	111
Aged [3] and Extracted [4]	143	143	124	150	115	116

(1) ML 4' at 212° F. (2) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (3) 24 hours at 100° C. in air oven. (4) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

mastication in the tuber. For instance, when the mastication was at 260° F., the viscosity curves for the X-464 stocks rose sharply in one-third the time longer than was experienced with the X-463 stocks. The sharp rise in the viscosity curve signalizes that the stock is about to scorch.

There were marked changes in the viscosity of the X-463 and the X-464 stocks. Starting with a polymer viscosity of 70, the X-463 stocks attained viscosities ranging from 51 to 75, depending upon the carbon black. The polymer viscosity of X-464 was 38, but its stocks reached viscosities ranging from 38 to 59. Obviously the addition of the carbon black and the milling operation caused greater stiffening in some of the X-464 stocks than in the X-463 stocks.

Rating of X-485 (41° F. and 55 Mooney) against Natural Rubber (80 Mooney)

Comparing the processing data of natural rubber and X-485, compounded with various carbon blacks, it is evident that, with several exceptions, the X-485 stocks consumed less power, mixed hotter, were less scorchy, extruded generally at a higher rate, shrank less, and were higher in viscosity.

The results show that five of the X-485 carbon black stocks required from 5 to 16 per cent more power, and seven required from 1 to 11 per cent less. The X-485 stocks mixed from 2° to 46° F. hotter, depending upon the carbon black. When tubed at 250° F. through a 3/64-inch die, the X-485 stocks scorched from 1 to 5 minutes slower. The Mooney scorch time at this temperature was from 19 to 68 minutes more, depending upon the carbon black. The X-485 stocks shrank as much as 25 per cent more, depending upon the carbon black. The extrusion rate at 200° F., through a 3/64-inch die, was from 19 to 70 per cent more for six of the carbon black stocks, from 2 to 34 per cent less for five, and unchanged for one.

The viscosity of the X-485 stocks increased at a less rapid rate than that of natural rubber upon prolonged mastication in the tuber. For instance, when the mastication was at 250° F., the viscosity curves for the X-485 stocks rose sharply from half to twice as long as was experienced with the natural rubber stocks. A sharp rise in the viscosity curve indicates that the stock is on the verge of scorching.

The remilling of the X-485 stock, compounded with Kosmos 60-Dixie 60, reduced its viscosity less than half as much as was experienced with the remilling of natural rubber. As indicated in Figure 32, 10 remillings of the X-485 stock resulted in a decrease of 15 points in the viscosity. Natural rubber, similarly compounded and subjected to similar remillings, met with a loss of 40 points in viscosity.

The viscosity of the X-485 stocks did not reach as high a level as that of natural rubber. Starting out with a polymer viscosity of 55, the X-485 stocks reached a viscosity with a low of 48 and a high of 71, depending upon the carbon black. Natural rubber, on the other hand, started out with a viscosity of 80 and was reduced to a viscosity range of 38 to 60, depending upon the carbon black.

Rating of GR-S-10 (122° F. and 53 Mooney) against Natural Rubber (80 Mooney)

Comparing the processing data of natural rubber and GR-S-10, compounded with various carbon blacks, it is evident that the GR-S-10 stocks consumed more power, generally mixed hotter, were less scorchy, with few exceptions extruded at a lower rate, shrank more, and were comparable in viscosity.

The results indicate that the GR-S-10 stocks required from 4 to 19 per cent more power, depending upon the carbon black. Nine of the GR-S-10 carbon black stocks mixed from 5° to 50° F. hotter, and three mixed from 7° to 20° F. cooler. When tubed at 250° F. through a 3/64-inch die, the GR-S-10 stocks scorched from 3 to 16 minutes slower. The Mooney scorch time at this temperature was from 27 to 82 minutes more, depending upon the carbon black. The GR-S-10 stocks shrank from 6 to 27 per cent more, depending upon the carbon black. The extrusion rate of the GR-S-10 stocks at 200° F., through a 3/64-inch die, was from 5 to 33 per cent more for the stocks containing highly reinforc-

TABLE 15—STATEX-K

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	276	304	311	300	310	270	272
Banbury, Power (Watt-Hours)	1190	1290	1295	1150	1195	1180	1135
Extrusion Rate at 200° F. (Grams per Minute)	11.1	8.1	11.5	13.2	6.9	7.5	8.5
Per Cent Shrinkage, Mill	23	32	44	29	25	12	9
Per Cent Shrinkage, Extrusion	45	47	51	49	47	44	43
Polymer Viscosity[1]	80	53	67	55	70	38	42
Compound Viscosity[1]	48	48	66	56	62	47	43
Tuber Scorch at 250° F. (Minutes)	3¾—	7¾	4¼	6+	4+	6	6¾—
Mooney Scorch MS at 250° F. (Minutes)	11	46	24	41	24	31	28
300% Modulus, Optimum Cure (PSI)	1660	1500	1460	1160	1980	1730	1660
Tensile Strength at Break, Optimum Cure (PSI)	4160	3170	4030	3900	3840	3650	3670
Per Cent Elongation at Break, Optimum Cure	580	520	635	700	485	525	560
Shore Hardness, Optimum Cure (Inches × 10^3)	62	59	60	58	66	67	64
Flex, De Mattia, Cut Growth to Failure (Flexes)[2]							
Unaged	89355	2545	4000	5108	2660	2895	—
Aged[3]	4920	3558	2150	1645	805	500	—
Abrasion Resistance Index (EPC = 100)[4]							
Aged[5] and Unextracted	123	130	130	131	72	87	87
Aged[5] and Extracted[6]	127	107	97	113	90	65	—
Goodrich Flexometer, 30′ Cycle, 60′ Cure (° F.)	—	265	256	254	195	204	—
Firestone Flexometer, 60′ Cycle, 60′ Cure (° F.)	—	228	226	215	194	211	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

ing carbon blacks and from 9 to 52 per cent less for the stocks containing other carbon blacks.

The viscosity of the GR-S-10 stocks increased at a lower rate than that of natural rubber upon prolonged mastication in the tuber. For instance, when the mastication was at 250° F., the viscosity curves for the GR-S-10 stocks took from twice to three times as long to rise sharply in comparison with the time required for the natural rubber stocks. The sharp rise in the viscosity curve is an indication that the stock is on the verge of scorching.

The remilling of the GR-S-10 stock, compounded with Kosmos 60-Dixie 60, as shown in Figure 32, produced less changes in viscosity than was experienced with the natural rubber stock similarly compounded and subjected to the same remillings.

The viscosity of the GR-S-10 stocks reached a low of 40 and a high of 58, as against 53 for the GR-S-10 polymer. On the other hand, natural rubber, starting out with a viscosity of 80, was reduced to a viscosity in the range of 38 to 60, depending upon the carbon black.

Relation between Mooney Scorch Time and Tuber Scorch Time at 250° F.

There is reason to believe, from the scorch time studies reported herewith, and from the bar graphs shown in Figures 34 and 35, that the tuber scorch time information may be more reliable than that of Mooney scorch time for predicting the scorch tendency of stocks in factory tubing operations. It is common experience that stocks often scorch in the factory tuber despite the high Mooney scorch time found for them in the laboratory.

Relation between Mill and Extrusion Shrinkage

Shrinkage values are of considerable help in predicting the processing characteristics of a stock. As reported in this study, length shrinkage was obtained for the mill and extruded stocks. The relationship between the two for the various GR-S polymers and natural rubber, compounded with Kosmos 60-Dixie 60, is presented in Figure 36. The shrinkage values of the mill stock may have greater significance because of the wider spread in their results. From a practical consideration it is a much easier procedure to determine the length shrinkage of a mill stock than that of the extruded stock.

Rating of Carbon Blacks

Of the carbon blacks included in this study, it is observed that some excel in processing, others in reinforcement; some appear to be better in natural rubber than in GR-S; some are better in low temperature GR-S than in regular GR-S; some made from petroleum oil are better than some made from natural gas, and vice versa. A review of the processing data of the various polymers, compounded with the different carbon blacks, leads to the conclusion that there is more freedom from scorch when the compound contains carbon black of large particle size, or when the carbon black is characterized by considerable structure, as is the case with acetylene black. However, the need for high reinforcement must focus the attention on carbon blacks with smaller particle size. The top-ranking carbon black types in this category are: easy processing channel (EPC), reinforcing furnace (RF), high abrasion furnace (HAF), and very fine furnace (VFF). Next in rank are the high modulus furnace blacks (HMF) and the fast extrusion furnace (FEF), made from petroleum oil. Third in rank is fine furnace (FF), and fourth is the high modulus furnace (HMF), made from natural gas.

Natural Rubber: In the case of natural rubber, the EPC black, Kosmobile 77-Dixiedensed 77, rates very high for processing because of its easy and cool mixing,

Table 16—Acetylene Black

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	326	306	327	333	298	288	292
Banbury, Power (Watt-Hours)	1250	1250	1140	1115	1080	1150	1145
Extrusion Rate at 200° F. (Grams per Minute)	11.2	10.2	15.1	15.2	10.4	10.7	10.8
Per Cent Shrinkage, Mill	7	19	13	9	6	5	8
Per Cent Shrinkage, Extrusion	41	38	38	36	35	32	32
Polymer Viscosity [1]	80	53	67	55	70	38	42
Compound Viscosity [1]	54	58	72	71	68	59	57
Tuber Scorch at 250° F. (Minutes)	3¾	12	6¾	6¾	6½	7¼	7½—
Mooney Scorch MS at 250° F. (Minutes)	9	72	42	50	41	23	34
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]							
Unaged	—	—	—	1535	—	—	—
Aged [3]	—	—	—	490	—	—	—
Abrasion Resistance Index (EPC = 100) [4]							
Aged [5] and Unextracted	—	—	—	73	—	—	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven.

Table 17— Kosmos 50-Dixie 50

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	312	296	300	314	286	280	278
Banbury, Power (Watt-Hours)	1210	1270	1160	1135	1115	1100	1130
Extrusion Rate at 200° F. (Grams per Minute)	11.4	10.0	15.8	15.3	9.6	10.6	10.3
Per Cent Shrinkage, Mill	11	24	22	13	13	7	10
Per Cent Shrinkage, Extrusion	46	42	42	40	40	36	36
Polymer Viscosity [1]	80	53	57	55	70	38	42
Compound Viscosity [1]	46	50	70	62	64	51	50
Tuber Scorch at 250° F. (Minutes)	3¼	9¼	4¾	5¾+	5—	6+	6½
Mooney Scorch MS at 250° F. (Minutes)	7	63	31	45	28	24	32
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]							
Unaged	—	—	—	2169	—	—	—
Aged [3]	—	—	—	790	—	—	—
Abrasion Resistance Index (EPC = 100) [4]							
Aged [5] and Unextracted	—	—	—	77	—	—	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven.

Table 18—Philblack-A

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.
Banbury, Maximum Temperature (° F.)	307	300	314	314	317
Banbury, Power (Watt-Hours)	1240	1290	1225	1190	1215
Extrusion Rate at 200° F. (Grams per Minute)	11.5	10.1	15.2	14.8	9.2
Per Cent Shrinkage, Mill	17	23	23	17	19
Per Cent Shrinkage, Extrusion	45	42	44	42	41
Polymer Viscosity [1]	80	53	67	55	70
Compound Viscosity [1]	49	50	72	64	64
Tuber Scorch at 250° F. (Minutes)	3¼+	8¾+	4¼	5¼	4½+
Mooney Scorch MS at 250° F. (Minutes)	9	59	27	41	24
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]					
Unaged	—	—	—	2728	—
Aged [3]	—	—	—	730	—
Abrasion Resistance Index (EPC = 100) [4]					
Aged [5] and Unextracted	—	—	—	96	—

(1) ML 4′ at 212° F. (2) 2.5″ stroke, 0.5″ bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven.

TABLE 19—STATEX-B

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	262	289	298	290	296	259	260
Banbury, Power (Watt-Hours)	1050	1240	1170	1105	1175	1070	1080
Extrusion Rate at 200° F. (Grams per Minute)	12.5	6.6	11.8	12.2	5.9	7.4	7.1
Per Cent Shrinkage, Mill	22	43	41	34	35	17	17
Per Cent Shrinkage, Extrusion	51	52	52	53	52	48	49
Polymer Viscosity[1]	80	53	67	55	70	38	42
Compound Viscosity[1]	45	41	57	52	55	40	38
Tuber Scorch at 250° F. (Minutes)	4+	10¾—	4¼+	6½+	4½+	6¾	7¾—
Mooney Scorch MS at 250° (Minutes)	14	59	31	49	26	30	30
300% Modulus, Optimum Cure (PSI)	—	—	—	890	—	—	—
Tensile Strength at Break, Optimum Cure (PSI)	—	—	—	3470	—	—	—
Per Cent Elongation at Break, Optimum Cure	—	—	—	710	—	—	—
Shore Hardness, Optimum Cure (Inches × 10³)	—	—	—	56	—	—	—
Flex, De Mattia, Cut Growth to Failure (Flexes)[2]							
Unaged	—	—	—	5692	—	—	—
Aged[3]	1905	—	—	1905	—	—	—
Abrasion Resistance Index (EPC = 100)[4]							
Aged[5] and Unextracted	—	—	—	70	—	—	—
Aged[5] and Extracted[6]	—	—	—	76	—	—	—

(1) ML 4' at 212° F. (2) 2.5" stroke, 0.5" bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

low scorch, and high rate of extrusion. Of course its shrinkage is quite high. The furnace process petroleum oil blacks—Kosmos 60-Dixie 60, Philblack-0, and Vulcan—and the furnace process natural gas black, Statex-K, are somewhat touchy in their processing in natural rubber because of scorch. Statex-K mixes somewhat easier and extrudes at a faster rate. Kosmos 60-Dixie 60 and Vulcan shrink the least: Philblack-O and Statex-K shrink considerably more. The furnace process petroleum oil blacks, Kosmos 50-Dixie 50 and Philblack-A, while on a par with Kosmos 60-Dixie 60 and Philblack-O for ease of mixing and scorch rating, extrude at a faster rate because of larger particle size. The furnace process natural gas black, Statex-B, is much better in processing, is less scorchy, and extrudes at a higher rate. However, surpassing Statex-B for processing is the HMF black, Kosmos 40-Dixie 40, which is also better in processing than the HMF black, Statex-93.

GR-S-10: Turning to GR-S-10 (122° F.), it is evident from the processing data that Kosmos 60-Dixie 60 excels in processing. Vulcan, Statex-K, and Philblack-O, in the order named, occupy an intermediate position between Kosmos 60-Dixie 60 and Kosmobile 77-Dixiedensed 77. High extrusion rates at factory tuber temperatures and low shrinkage particularly characterize the Kosmos 60-Dixie 60 black. Kosmobile 77-Dixiedensed 77 appears to be the least scorchy, but is below the others in rate of extrusion. Statex-K is lowest in compound viscosity. Acetylene black, Kosmos 50-Dixie 50, and Philblack-A, in the order named, rate next for ease of processing. They are less scorchy, and at 200° F. extrude at a lower rate than Kosmos 60-Dixie 60 but at a faster rate than Vulcan and Philblack-O. At higher tuber temperatures, Kosmos 50-Dixie 50 extrudes at a slightly higher rate than Kosmos 60-Dixie 60. Statex-B rates next for easier and cooler mixing, lower scorch, and lower compound viscosity. However, its rate of extrusion is comparatively low. Kosmos 40-Dixie 40 and Statex-93 rate next in ease of processing. They scorch much less than Statex-B.

Low Temperature GR-S: Considering low temperature GR-S, it is evident from the processing data that Kosmos 60-Dixie 60 leads the top-ranking reinforcing carbon blacks from the standpoint of processing. It has the highest extrusion rate at factory tuber temperatures and the lowest shrinkage. Vulcan, Philblack-O, Statex-K, and Kosmobile 77-Dixiedensed 77, in the order named, are next. This entire group is scorchy, and the rating of the carbon blacks, with reference to scorch, is dependent upon the "cold rubber" used and the temperature of the tuber.

Thus, in X-485 (41° F. and 55 Mooney), Statex-K appears to be the least scorchy, Philblack-O and Kosmos 60-Dixie 60 the most. In X-435 (41° F. and 70 Mooney) there is somewhat less difference among the carbon blacks as to the scorch rating. In X-463 (14° F. and 70 Mooney) the difference among the blacks is narrowed further. The same holds true for the group in X-464 (0° F. and 38 Mooney). Acetylene black, Kosmos 50-Dixie 50, and Philblack-A, in the order named, rate still better for ease of processing in low temperature GR-S. They are less scorchy and low in shrinkage, and they extrude at a slightly higher rate. Acetylene black is characterized by particularly low shrinkage. Statex-B mixes easier and cooler, is less scorchy, and extrudes at a lower rate. It has a high shrinkage. Kosmos 40-Dixie 40 and Statex-93 are even better in processing than Statex-B, particularly from the standpoint of scorch.

Discussion of Reinforcement

A discussion of the reinforcement characteristics of "cold rubber" must necessarily embrace all phases of reinforcement responsible for the high resistance to abrasion evidenced by the low temperature polymers, compounded with highly reinforcing carbon black. The

TABLE 20—KOSMOS 40-DIXIE 40

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	262	278	292	286	282	258	250
Banbury, Power (Watt-Hours)	1040	1190	1145	1140	1085	1055	1050
Extrusion Rate at 200° F. (Grams per Minute)	13.4	6.4	14.6	12.7	7.8	8.0	8.4
Per Cent Shrinkage, Mill	19	46	40	31	30	17	15
Per Cent Shrinkage, Extrusion	50	55	50	54	51	48	48
Polymer Viscosity[1]	80	53	67	55	70	38	42
Compound Viscosity[1]	40	41	55	49	51	41	35
Tuber Scorch at 250° F. (Minutes)	5+	16¾	6¾	9½	6¼+	8	9½—
Mooney Scorch MS at 250° (Minutes)	20	94	47	72	42	40	37
300% Modulus, Optimum Cure (PSI)	—	—	—	800	—	—	—
Tensile Strength at Break, Optimum Cure (PSI)	—	—	—	2930	—	—	—
Per Cent Elongation at Break, Optimum Cure	—	—	—	770	—	—	—
Shore Hardness, Optimum Cure (Inches × 10^2)	—	—	—	54	—	—	—
Flex, De Mattia, Cut Growth to Failure (Flexes)[2]							
Unaged	—	—	—	5916	—	—	—
Aged[3]	—	—	—	1405	—	—	—
Abrasion Resistance Index (EPC = 100)[4]							
Aged[5] and Unextracted	—	—	—	44	—	—	—
Aged[5] and Extracted[6]	—	—	—	44	—	—	—

(1) ML 4' at 212° F. (2) 2.5" stroke, 0.5" bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

polymer displaying the highest resistance to abrasion will obviously command the greatest attention. But with each polymer must also be considered the carbon black, since the latter is equally important in bringing about the desired reinforcement. This being the case, the discussion to follow centers on rating the polymers as well as the carbon blacks.

Rating of X-485 (41° F. and 55 Mooney) against GR-S-10 (122° F. and 53 Mooney)

The reinforcement data of X-485 and GR-S-10, compounded with reinforcing carbon black, show that the X-485 stocks cured slower, were lower in modulus, higher in tensile strength, higher in elongation at break, comparable in hardness, poorer in aging, lower in heat build-up, higher in resistance to flex cracking when unaged but lower when aged, and higher in resistance to abrasion.

The X-485 stocks were approximately 15 to 20 minutes slower in curing. Depending upon the carbon black and at the optimum cure, they were from 170 to 500 pounds lower in modulus at 300 per cent elongation; from 270 to 1250 pounds higher in tensile strength at break; from 125 to 190 per cent higher in elongation at break; comparable in hardness; from 6 to 16 per cent poorer in aging, based on degradation in tensile strength; from 10° to 30° F. cooler running, based on the results with the Goodrich flexometer, and from 4° to 20° F. cooler running, based on the results with the Firestone flexometer; from 40 to 100 per cent better in resistance to flex cracking when the stocks were unaged, but from 23 to 54 per cent poorer when the stocks were aged; and from 1 to 63 points higher in the rating of abrasion when the stocks were aged and unextracted, and from 4 to 51 points higher when the stocks were aged and extracted.

Rating of X-463 (14° F. and 70 Mooney) against GR-S-10 (122° F. and 53 Mooney)

The reinforcement data of X-463 and GR-S-10, compounded with reinforcing carbon black, show that the X-463 stocks cured faster, were higher in modulus, higher in tensile strength, lower in elongation at break, higher in hardness, poorer in aging, lower in heat build-up, slightly better in resistance to flex cracking when unaged but poorer when aged, and lower in resistance to abrasion.

The X-463 stocks were much faster in curing. Depending upon the carbon black and at the optimum cure, they were from 270 to 790 pounds higher in modulus at 300 per cent elongation; from 670 to 1030 pounds higher in tensile strength at break; from 10 to 50 per cent lower in elongation at break; from 5 to 8 points higher in hardness; from 2 to 17 per cent poorer in aging, based on degradation in tensile strength; from 60° to 101° F. cooler running, based on the results with the Goodrich flexometer, and from 29° to 34° F. cooler running, based on the results with the Firestone flexometer; from 2 to 49 per cent poorer in resistance to flex cracking for two carbon black stocks, and from 5 to 87 per cent better for two when the stocks were unaged, but from 11 to 70 per cent poorer when the stocks were aged; and from 46 to 63 points lower in the rating of abrasion when the stocks were aged and unextracted, and from 20 to 28 points lower for three carbon black stocks and 3 points higher for one when the stocks were aged and extracted.

Rating of X-464 (0° F. and 38 Mooney) against GR-S-10 (122° F. and 53 Mooney)

The reinforcement data of X-464 and GR-S-10, compounded with reinforcing carbon black, show that the X-464 stocks cured faster, were higher in modulus, higher in tensile strength, higher in elongation at break, higher in hardness, poorer in aging, lower in heat build-up, higher in resistance to flex cracking when unaged but poorer when aged, and lower in resistance to abrasion.

The X-464 stocks were much faster in curing. De-

TABLE 21—STATEX-93

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.
Banbury, Maximum Temperature (° F.)	267	279	292	291	291
Banbury, Power (Watt-Hours)	1070	1195	1125	1060	1170
Extrusion Rate at 200° F. (Grams per Minute)	13.2	7.4	13.9	13.2	7.4
Per Cent Shrinkage, Mill	21	42	37	31	36
Per Cent Shrinkage, Extrusion	49	51	51	49	48
Polymer Viscosity [1]	80	53	67	55	70
Compound Viscosity [1]	40	40	55	51	53
Tuber Scorch at 250° F. (Minutes)	5+	17½+	5¾+	8¾+	5½—
Mooney Scorch MS at 250° F. (Minutes)	15	85	44	64	38
300% Modulus, Optimum Cure (PSI)	—	—	—	950	—
Tensile Strength at Break, Optimum Cure (PSI)	—	—	—	3100	—
Per Cent Elongation at Break, Optimum Cure	—	—	—	735	—
Shore Hardness, Optimum Cure (Inches × 10^3)	—	—	—	56	—
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]					
Unaged	—	—	—	4488	—
Aged [3]	—	—	—	960	—
Abrasion Resistance Index (EPC = 100) [4]					
Aged [3] and Unextracted	—	—	—	56	—
Aged [5] and Extracted [6]	—	—	—	58	—

(1) ML 4' at 212° F. (2) 2.5" stroke, 0.5" bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (5) 24 hours at 100° C. in air oven. (6) Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

pending upon the carbon black and at the optimum cure, they were from 230 to 480 pounds higher in modulus at 300 per cent elongation; from 480 to 1010 pounds higher in tensile strength at break; from 5 to 30 per cent higher in elongation at break for three carbon black stocks, and 10 per cent lower for one carbon black stock; from 8 to 10 points higher in hardness; from 5 to 17 per cent poorer in aging, based on degradation in tensile strength; from 50° to 85° F. cooler running, based on the results with the Goodrich flexometer, and from 17° to 29° F. cooler running, based on the results with the Firestone flexometer; from 14 to 162 per cent better in resistance to flex cracking when the stocks were unaged, but from 17 to 87 per cent poorer when the stocks were aged; and from 42 to 47 points lower in the rating of abrasion when the stocks were aged and unextracted, and from 42 to 58 points lower for two carbon black stocks, and 32 points higher for one when the stocks were aged and extracted.

Rating of X-485 (41° F. and 55 Mooney) against X-435 (41° F. and 67 Mooney)

The reinforcement data of X-485 and X-435, compounded with reinforcing carbon black, indicate that the X-485 stocks cured slower, were lower in modulus, lower in tensile strength, higher in elongation at break, lower in hardness, poorer in aging, higher in heat build-up, higher in resistance to flex cracking when unaged and when aged, and higher in resistance to abrasion.

The X-485 stocks were approximately 20 to 30 minutes slower in curing. Depending upon the carbon black and at the optimum cure, they were from 300 to 420 pounds lower in modulus at 300 per cent elongation; from 130 to 340 pounds lower in tensile strength at break; from 50 to 70 per cent higher in elongation at break; from 1 to 4 points lower in hardness; from 2 to 4 per cent poorer in aging for three carbon black stocks, and 8 per cent better for one, based on degradation in tensile strength; from 9° to 26° F. hotter running for three carbon black stocks, and 2° F. cooler running for one, based on the results with the Goodrich flexometer, and from 1° to 6° F. hotter running for two carbon black stocks, 11° F. cooler running for one, and no change in a fourth, based on the results with the Firestone flexometer; from 25 to 28 per cent better in resistance to flex cracking for two carbon black stocks, and from 25 to 30 per cent poorer for two when the stocks were unaged, but from 24 to 31 per cent poorer for two carbon black stocks, and from 10 to 44 per cent better for two when the stocks were aged; and from 1 to 34 points higher in the rating of abrasion when the stocks were aged and unextracted, and from 16 to 32 points higher when the stocks were aged and extracted.

Rating of X-463 (14° F. and 70 Mooney) against X-485 (41° F. and 55 Mooney)

The reinforcement data of X-463 and X-485, compounded with reinforcing carbon black, indicate that the X-463 stocks cured faster, were higher in modulus, comparable in tensile strength, lower in elongation at break, higher in hardness, poorer in aging in some cases and better in other cases, lower in heat build-up, lower in resistance to flex cracking, and lower in resistance to abrasion.

The X-463 stocks were much faster in curing. Depending upon the carbon black and at the optimum cure, they were from 730 to 1020 pounds higher in modulus at 300 per cent elongation; from 60 to 120 pounds lower in tensile strength at break for two carbon black stocks, and from 70 to 480 pounds higher for three; from 155 to 215 per cent lower in elongation at break; from 5 to 8 points higher in hardness; 3 per cent poorer in aging for two carbon black stocks, and from ½ to 5 per cent better for two, based on degradation in tensile strength; from 50° to 72° F. cooler running, based on the results with the Goodrich flexometer, and from 14° to 30° F. cooler running, based on the results with the Firestone flexometer; from 32 to 48 per cent poorer in resistance

TABLE 22—KOSMOS 20-DIXIE 20

Rubber	Crude	GR-S-10 122° F.	X-435 41° F.	X-485 41° F.	X-463 14° F.	X-464 0° F.
Banbury, Maximum Temperature (° F.)	267	274	284	291	283	258
Banbury, Power (Watt-Hours)	1035	1180	1130	1170	1210	1090
Extrusion Rate at 200° F. (Grams per Minute)	13.2	6.9	13.8	11.6	8.4	8.1
Per Cent Shrinkage, Mill	18	44	36	43	40	20
Per Cent Shrinkage, Extrusion	49	54	53	51	47	48
Polymer Viscosity [1]	80	53	67	55	70	38
Compound Viscosity [1]	38	40	53	48	51	38
Tuber Scorch at 250° F. (Minutes)	5½+	21—	7¼—	10¼	6¾	9+
Mooney Scorch MS at 250° F. (Minutes)	21	103	58	89	46	39
300% Modulus, Optimum Cure (PSI)	—	—	—	690	—	—
Tensile Strength at Break, Optimum Cure (PSI)	—	—	—	2770	—	—
Per Cent Elongation at Break, Optimum Cure	—	—	—	835	—	—
Shore Hardness, Optimum Cure (Inches × 10³)	—	—	—	54	—	—
Flex, De Mattia, Cut Growth to Failure (Flexes) [2]						
Unaged	—	—	—	5820	—	—
Aged [3]	—	—	—	795	—	—
Abrasion Resistance Index (EPC = 100) [4]						
Aged [5] and Unextracted	—	—	—	38	—	—
Aged [6] and Extracted [6]	—	—	—	29	—	—

(1) ML 4' at 212° F. (2) 2.5" stroke, 0.5" bend, 300 RPM. (3) 48 hours at 100° C. in air oven. (4) Goodyear Angle Machine, modified. 16° angle, 32# load, 50 RPM. (Method of Rubber Laboratory, National Research Council, Ottawa, Canada.

to flex cracking for three carbon black stocks, and 2 per cent better for one when the stocks were unaged, but from 47 to 80 per cent poorer when the stocks were aged; and from 59 to 127 points lower in the rating of abrasion when the stocks were aged and unextracted, and from 23 to 48 points lower when the stocks were aged and extracted.

Rating of X-463 (14° F. and 70 Mooney) against X-435 (41° F. and 67 Mooney)

The reinforcement data of X-463 and X-435, compounded with reinforcing carbon black, show that the X-463 stocks cured faster, were higher in modulus, lower in tensile strength, lower in elongation at break, higher in hardness, comparable in aging, lower in heat build-up, generally lower in resistance to flex cracking when unaged and when aged, and lower in resistance to abrasion.

The X-463 stocks were much faster in curing. Depending upon the carbon black and at the optimum cure, they were from 430 to 600 pounds higher in modulus at 300 per cent elongation; from 120 to 460 pounds lower in tensile strength at break for four carbon black stocks, and 210 pounds higher for one; from 90 to 150 per cent lower in elongation at break; from three to six points higher in hardness; from ½ to 3 per cent poorer in aging for two carbon black stocks, and 4 per cent better for one, based on degradation in tensile strength; from 41° to 61° F. cooler running, based on the results with the Goodrich flexometer, and from 14° to 30° F. cooler running, based on the results with the Firestone flexometer; from 5 to 74 per cent poorer in resistance to flex cracking for three carbon black stocks and 12 per cent better for one when the stocks were unaged, but from 53 to 71 per cent poorer when the stocks were aged; and from 48 to 93 points lower in the rating of abrasion when the stocks were aged and unextracted, and from 7 to 16 points lower for one carbon black stock, and 1 point better for another when the stocks were aged and extracted.

Rating of X-464 (0° F. and 38 Mooney) against X-485 (41° F. and 55 Mooney)

The reinforcement data of X-464 and X-485, compounded with reinforcing carbon black, show that the X-464 stocks cured faster, were higher in modulus, lower in tensile strength, lower in elongation at break, higher in hardness, comparable in aging, lower in heat build-up, comparable in resistance to flex cracking when unaged but poorer when aged, and lower in resistance to abrasion.

The X-464 stocks were much faster in curing. Depending upon the carbon black and at the optimum cure, they were from 410 to 710 pounds higher in modulus at 300 per cent elongation; from 40 to 250 pounds lower in tensile strength at break; from 115 to 175 per cent lower in elongation at break; from 7 to 10 points higher in hardness; from 1 to 5 per cent poorer in aging, based on degradation in tensile strength; from 40° to 55° F. cooler running, based on the results with the Goodrich flexometer, and from 4° to 25° F. cooler running, based on the results with the Firestone flexometer; from 11 to 43 per cent poorer in resistance to flex cracking for two carbon black stocks, and from 37 to 43 per cent better for two when the stocks were unaged, but from 15 to 80 per cent poorer when the stocks were aged; and from 5 to 76 points lower in the rating of abrasion when the stocks were aged and unextracted, and from 19 to 62 points lower when the stocks were aged and extracted.

Rating of X-464 (0° F. and 38 Mooney) against X-463 (14° F. and 70 Mooney)

The reinforcement data of X-464 and X-463, compounded with reinforcing carbon black, show that the X-464 stocks cured slower, were lower in modulus, lower in tensile strength, higher in elongation at break, higher in hardness, poorer in aging, higher in heat build-up, higher in resistance to flex cracking when unaged and either higher or lower when aged, and comparable in resistance to abrasion.

TABLE 23—PROCESSING CHARACTERISTICS WITH VARIOUS CARBON BLACKS

	Rate of Extrusion (Grams per Minute)				Scorch at 250° F.		Length Shrinkage
Tuber Temp., ° F.	200	230	240	270	Tuber	Mooney	Mill
Die, Inches	3/64	1/8	1/8	1/8	(Minutes)	(Minutes)	(Per Cent)
Natural Rubber (80 Mooney)							
Kosmos 60-Dixie 60	8.9	31.5	27.8	28.5	3+	9	14
Philblack-O	7.9	30.8	30.0	26.6	3¼+	11	21
Statex-K	11.1	37.0	35.5	32.4	3¾—	11	23
Kosmobile 77-Dixiedensed 77	10.7	38.0	35.2	31.8	3½+	23	26
GR-S-10 (122° F. and 53 Mooney)							
Kosmos 60-Dixie 60	11.8	37.6	35.6	35.9	6½—	43	20
Philblack-O	9.4	33.5	32.9	31.8	6+	38	28
Statex-K	8.1	33.6	32.0	31.3	7¾	46	32
Kosmobile 77-Dixiedensed 77	6.4	25.7	25.9	24.7	8¾	79	34
X-485 (41° F. and 55 Mooney)							
Kosmos 60-Dixie 60	15.0	40.5	38.7	37.0	4¾	30	17
Philblack-O	13.4	39.4	37.4	34.9	5	30	25
Statex- K	13.2	39.6	37.3	36.4	6+	41	29
Kosmobile 77-Dixiedensed 77	8.6	30.9	31.5	30.3	4¾	56	42

The X-464 stocks were approximately 15 to 20 minutes slower in curing. Depending upon the carbon black and at the optimum cure, they were from 250 to 320 pounds lower in modulus at 300 per cent elongation; from 110 to 190 pounds lower in tensile strength at break; from 40 to 65 per cent higher in elongation at break; from 1 to 2 points higher in hardness; from less than ½ to 4 per cent poorer in aging, based on degradation in tensile strength; from 9° to 17° F. hotter running, based on the results with the Goodrich flexometer, and from 3° to 17° F. hotter running, based on the results with the Firestone flexometer; from 9 to 262 per cent better in resistance to flex cracking when the stocks were unaged, but from 3 to 38 per cent poorer for two carbon black stocks and from 44 to 101 per cent better for two when the stocks were aged; and from 15 to 22 points higher in the rating of abrasion for two carbon black stocks, and one point lower for one when the stocks were aged and unextracted, and from 25 to 37 points lower for two carbon black stocks, and 29 points higher for one when the stocks were aged and extracted.

Rating of X-485 (41° F. and 55 Mooney) against Natural Rubber (80 Mooney)

The reinforcement data of X-485 and natural rubber, compounded with reinforcing carbon black, show that the X-485 stocks cured slower, were lower in modulus, lower in tensile strength, higher in elongation at break, lower in hardness, better in aging, generally lower in resistance to flex cracking when unaged and when aged, and generally higher in resistance to abrasion.

The X-485 stocks were approximately 30 minutes slower in curing. Depending upon the carbon black and at the optimum cure, they were from 310 to 630 pounds lower in modulus at 300 per cent elongation; from 110 to 260 pounds lower in tensile strength at break for four carbon black stocks, and 100 pounds higher for one; from 55 to 165 per cent higher in elongation at break; from 2 to 4 points lower in hardness for four carbon black stocks, and no change for one; from 18 to 33 per cent better in aging, based on degradation in tensile strength; from 82 to 96 per cent poorer in resistance to flex cracking when the stocks were unaged, but from 49 to 67 per cent poorer for three carbon black stocks, and 11 per cent better for one when the stocks were aged; and from 8 to 74 points higher in the rating of abrasion for three carbon black stocks, and 15 points lower for one when the stocks were aged and unextracted, and from 7 to 16 points higher for three carbon black stocks, and 14 points lower for one when the stocks were aged and extracted.

Rating of GR-S-10 (122° F. and 53 Mooney) against Natural Rubber (80 Mooney)

The reinforcement data of GR-S-10 and natural rubber, compounded with reinforcing carbon black, show that the GR-S-10 stocks cured slower, were lower in modulus, lower in tensile strength, lower in elongation at break, lower in hardness, better in aging, generally lower in resistance to flex cracking when unaged and when aged, slightly higher in resistance to abrasion.

The GR-S-10 stocks were 15 minutes slower in curing. Depending upon the carbon black and at the optimum cure, they were from 120 to 180 pounds lower in modulus at 300 per cent elongation; from 430 to 1570 pounds lower in tensile strength at break; from 25 to 85 per cent lower in elongation at break; from 1 to 4 points lower in hardness; from 23 to 27 per cent better in aging, based on degradation in tensile strength; from 40 to 97 per cent poorer in resistance to flex cracking when the stocks were unaged, and from 28 to 33 per cent poorer for two carbon black stocks, and 70 per cent better for one when the stocks were aged; and from 7 to 11 points higher in the rating of abrasion for two carbon black stocks, and from 12 to 44 points lower for two when the stocks were aged and unextracted, and from 20 to 42 points lower for two carbon black stocks, 12 points higher for one, and no change for another when the stocks were aged and extracted.

Rating of Carbon Blacks

Judging from the reinforcement data of the various carbon blacks, it appears that the group of blacks on which "cold rubber" will most likely depend for high reinforcement and high resistance to wear will consist of channel black and the furnace process blacks classified as reinforcing furnace (RF), high abrasion furnace (HAF), and very fine furnace (VFF). The carbon blacks in this group and which were included in this

TABLE 24—REINFORCEMENT CHARACTERISTICS WITH VARIOUS CARBON BLACKS

Stress Strain
(Optimum Cure)

	300% Modulus (psi)		Tensile Strength (psi)		% Elongation		Shore Hardness (Inches × 10^3)	
	Unaged	Aged	Unaged	Aged	Unaged	Aged	Unaged	Aged
Crude								
Kosmobile 77-Dixiedensed 77	1280	1100	4500	3280	645	485	62	68
Kosmos 60-Dixie 60	2190	1430	3880	2460	475	320	64	67
Philblack-O	1920	1330	3960	2500	510	330	61	68
Statex-K	1660	1220	4160	2860	580	425	62	68
GR-S-10								
Kosmobile 77-Dixiedensed 77	1140	1020	2930	2870	560	410	58	65
Kosmos 60-Dixie 60	2070	1750	2970	3330	410	340	62	68
Philblack-O	1740	1620	3130	3000	450	310	60	66
Statex-K	1500	1400	3170	3100	520	370	59	65
X-485								
Kosmobile 77-Dixiedensed 77	970	910	4180	3800	700	530	58	66
Kosmos 60-Dixie 60	1780	1560	3770	3620	560	410	62	69
Philblack-O	1510	1320	4060	3660	575	410	61	65
Statex-K	1160	1120	3900	3570	700	490	58	65
X-463								
Kosmobile 77-Dixiedensed 77	1700	1290	4060	3500	510	415	66	69
Kosmos 60-Dixie 60	2700	2000	3850	3680	400	340	69	70
Philblack-O	2530	1650	4130	3870	420	350	66	68
Statex-K	1980	1380	3840	3610	485	410	66	68
X-464 (38 Mooney)								
Kosmobile 77-Dixiedensed 77	1380	1130	3940	3380	575	460	68	70
Kosmos 60-Dixie 60	2370	1820	3680	3510	440	375	70	72
Philblack-O	2220	1610	4020	3660	460	360	68	70
Statex-K	1730	1280	3650	3280	525	420	67	69

study are: Kosmobile 77-Dixiedensed 77 (EPC), Kosmos 60-Dixie 60 (RF). Philblack-O and Vulcan (HAF), and Statex-K (VFF). Comparing the reinforcement data of these blacks for natural rubber and the various GR-S polymers, the following ratings of the blacks are in order for each specific property which contributes to high reinforcement:

Rate of Cure: In natural rubber Kosmos 60-Dixie 60 is fastest in cure, and is followed by Philblack-O, Statex-K, Vulcan, and Kosmobile 77-Dixiedensed 77, in the order named. In all the GR-S polymers studied, depending on whether the initial modulus or the initial tensile strength is considered as the criterion for judging rate of cure, either Kosmos 60-Dixie 60 or Philblack-O is fastest, and Kosmobile 77-Dixiedensed 77 or Vulcan is slowest, with Statex-K occupying the intermediate position.

Modulus: In natural rubber Kosmos 60-Dixie 60 is highest, and is followed by Philblack-O, Vulcan, Statex-K, and Kosmobile 77-Dixiedensed 77, in the order named. In all the GR-S polymers studied, Kosmos 60-Dixie 60 shows the highest modulus, and is followed in turn by Philblack-O, Statex-K, Vulcan, and Kosmobile 77-Dixiedensed 77, in the order named.

Tensile Strength at Break: In natural rubber and in all the GR-S polymers studied, Kosmobile 77-Dixiedensed 77 shows the highest tensile strength, and is followed by Statex-K, Philblack-O, Kosmos 60-Dixie 60, and Vulcan, in the order named.

Per Cent Elongation at Break: In natural rubber and in all the GR-S polymers studied, Kosmobile 77-Dixiedensed 77 shows the highest per cent elongation at break, and is generally followed by Statex-K, Vulcan, Philblack-O, and Kosmos 60-Dixie 60, in the order named.

Hardness: In natural rubber Kosmos 60-Dixie 60 shows the highest hardness, and is followed by Kosmobile 77-Dixiedensed 77, Statex-K, Philblack-O, and Vulcan, in the order named. In all the GR-S polymers studied, Kosmos 60-Dixie 60 also shows the highest hardness, and is followed by Philblack-O and then by either Statex-K or Kosmobile 77-Dixiedensed 77, and finally by Vulcan.

Aging: In natural rubber Kosmos 60-Dixie 60 and Philblack-O are best in aging, based on the degradation in tensile strength, and are followed by Statex-K and Kosmobile 77-Dixiedensed 77, in the order named. In all the GR-S polymers studied, Kosmos 60-Dixie 60 rates best in aging. In GR-S-10 (122° F.). Kosmos 60-Dixie 60 is followed by Kosmobile 77-Dixiedensed 77, Statex-K, and Philblack-O. In X-485 (41° F. and 55 Mooney), Kosmos 60-Dixie 60 is followed by Statex-K, Kosmobile 77-Dixiedensed 77, and Philblack-O. In X-435 (41° F. and 67 Mooney), and in X-464 (0° F. and 38 Mooney), Kosmos 60-Dixie 60 is followed by Philblack-O, Statex-K, and Kosmobile 77-Dixiedensed 77. In X-463 (14° F. and 70 Mooney). Kosmos 60-Dixie 60 is followed by Statex-K, Philblack-O, and Kosmobile 77-Dixiedensed 77.

Heat Build-Up: In natural rubber and in all the GR-S polymers studied, Philblack-O generally runs slightly cooler, and is followed by Kosmos 60-Dixie 60, Statex-K,

TABLE 25—FLEX CHARACTERISTICS WITH VARIOUS CARBON BLACKS

Flex, De Mattia, Cut Growth to Failure[1]

(Flexes)

	Crude	GR-S-10	X-435	X-485	X-463	X-464
Polymerization Temperature (° F.)	——	122	41	41	14	0
Mooney ML 4' at 212° F.	80	53	67	55	70	38
	Unaged					
Kosmobile 77-Dixiedensed 77	20795	2575	2240	3680	2515	3278
Kosmos 60-Dixie 60	67310	1935	3835	2700	990	3685
Philblack-O	75835	2100	3080	3845	3920	5493
Statex-K	89355	2545	4000	5108	2660	2895
	Aged[2]					
Kosmobile 77-Dixiedensed 77	4020	2845	1440	1585	675	1355
Kosmos 60-Dixie 60	1865	1243	1370	952	502	725
Philblack-O	2329	3958	1792	2578	525	512
Statex-K	4920	3558	2150	1645	805	500

(1) 2.5" stroke, 0.5" bend, 300 RPM. (2) 48 hours at 100° C. in air oven.

and Kosmobile 77-Dixiedensed 77, in mixed order, depending on the polymer and whether the results are based on the Goodrich flexometer or the Firestone flexometer.

Resistance to Flex Cracking: In aged natural rubber Statex-K shows the highest resistance, and is followed by Kosmobile 77-Dixiedensed 77, Philblack-0, and Kosmos 60-Dixie 60, in the order named. In all the aged GR-S polymers studied, there is a shifting in the rating of the carbon blacks, depending upon the polymer, with Kosmobile 77-Dixiedensed 77, Statex-K, and Philblack-0 alternating as the best.

Resistance to Abrasion: In natural rubber, when aged and unextracted, Kosmos 60-Dixie 60 rates highest, and is followed by Philblack-0, Vulcan, Statex-K, and Kosmobile 77-Dixiedensed 77, in the order named. Kosmos 60-Dixie 60 tests 13 per cent better than Philblack-0. However, when aged and extracted, Philblack-0 rates best, followed by Kosmos 60-Dixie 60, Vulcan, Statex-K, and Kosmobile 77-Dixiedensed 77, in the order named. In this case Philblack-0 tests 10 per cent better than Kosmos 60-Dixie 60.

Since it is held by Griffith and his co-workers that tire tread surface, while being abraded on the road, may be looked upon as extracted rubber and may be considered as conforming closely to the extracted laboratory specimen, it would be reasonable to assume that laboratory abrasion tests with extracted rubber would be preferred to those of unextracted rubber in rating stocks for road wear performance.

On this basis, in the low temperature polymers studied, Kosmos 60-Dixie 60 and Philblack-0 rate best for the resistance to abrasion, the difference between the two blacks being very slight. In X-485 (41° F. and 55 Mooney), the abrasion resistance of Kosmos 60-Dixie 60 is only 6 per cent under that of Philblack-0; in X-435 (41° F. and 67 Mooney), it is only 3 per cent less; whereas in X-463 (14° F. and 70 Mooney), Kosmos 60-Divie 60 is 9 per cent better. Kosmobile 77-Dixiedensed 77 and Statex-K, in low temperature GR-S, rate lower in resistance to abrasion, with Kosmobile 77-Dixiedensed 77 slightly better.

[9] Griffith, T. R., Storey, E. B., Barkley, J. W. D., and McGilvray, F. M., "Relationship between Laboratory Abrasion Tests and Service Performance," *Analytical Chemistry*, Vol. 20, pp. 837-847 (September, 1948).

TABLE 26—RESISTANCE TO ABRASION WITH VARIOUS CARBON BLACKS

(Rating Against Channel Black as 100)

	Crude	GR-S-10	X-435	X-485	X-463	X-464	X-464
Polymerization Temperature (° F.)	——	122	41	41	14	0	0
Mooney ML 4' at 212° F.	80	53	67	55	70	38	42
	Unextracted (Aged)						
Kosmobile 77-Dixiedensed 77	100	100	100	100	100	100	100
Kosmos 60-Dixie 60	205	161	163	190	115	114	92
Philblack-O	179	190	219	253	126	148	112
Vulcan	155	143	171	179	80	——	111
Statex-K	123	130	130	131	72	87	87
	Extracted (Aged)						
Kosmobile 77-Dixiedensed 77	100	100	100	100	100	100	100
Kosmos 60-Dixie 60	155	167	145	171	146	109	91
Philblack-O	173	131	150	182	134	163	——
Vulcan	143	143	124	150	115	——	116
Statex-K	127	107	97	113	90	65	——

TABLE 27—RATING OF POLYMERS WITH VARIOUS CARBON BLACKS

Rating of	X-485 (41° F. and 55 Mooney)	X-463 (14° F. and 70 Mooney)	X-464 (0° F. and 38 Mooney)	X-485 (41° F. and 55 Mooney)	X-463 (14° F. and 70 Mooney)
Against	GR-S-10 (122° F. and 53 Mooney)	GR-S-10 (122° F. and 53 Mooney)	GR-S-10 (122° F. and 53 Mooney)	X-435 (41° F. and 67 Mooney)	X-485 (41° F. and 55 Mooney)
Processing					
Maximum Temperature	Cooler [1]	Hotter	Cooler	Cooler	Hotter
Power	Less	Less [4]	Less	Less	More
Shrinkage	Less [2]	Less [5]	Less	Less [11]	Less [16]
Scorch, Tuber	More	More	More	Less	More
Scorch, Mooney	More	More	More	Less	More
Extrusion Rate	Higher	Lower	Lower	Higher [12]	Lower
Cure	Slower	Faster	Faster	Slower	Faster
Reinforcement					
Modulus	Lower	Higher	Higher	Lower	Higher
Tensile Strength	Higher	Higher	Higher	Lower	Higher [17]
Elongation	Higher	Lower	Higher	Higher	Lower
Hardness	Comparable	Higher	Higher	Lower	Higher
Heat Build-Up	Lower	Lower	Lower	Higher [13]	Lower
Flex Cracking (Aged)	Poorer	Poorer	Poorer	Better [14]	Poorer
Flex Cracking (Unaged)	Better	Better [7]	Better	Better [15]	Poorer [18]
Abrasion					
aged and unextracted	Higher	Lower	Lower	Higher	Lower
aged and extracted	Higher	Lower [8]	Lower [10]	Higher	Lower

Rating of	X-463 (14° F. and 70 Mooney)	X-464 (0° F. and 38 Mooney)	X-464 (0° F. and 38 Mooney)	X-485 (41° F. and 55 Mooney)	GR-S-10 (122° F. and 53 Mooney)
Against	X-435 (41° F. and 67 Mooney)	X-485 (41° F. and 55 Mooney)	X-463 (14° F. and 70 Mooney)	Natural Rubber (80 Mooney)	Natural Rubber (80 Mooney)
Processing					
Maximum Temperature	Cooler [19]	Cooler	Cooler	Hotter	Hotter
Power	Less [20]	Less [26]	Less	Less [33]	More
Shrinkage	Less	Less	Less	More	More
Scorch, Tuber	More [21]	Less [27]	Less	Less	Less
Scorch, Mooney	More [22]	More	Less	Less	Less
Extrusion Rate	Lower	Lower	Higher	Higher [34]	Higher [43]
Cure	Faster	Faster	Slower	Slower	Slower
Reinforcement					
Modulus	Higher	Higher	Lower	Lower	Lower
Tensile Strength	Lower [23]	Lower	Lower	Lower [35]	Lower
Elongation	Lower	Lower	Higher	Higher	Lower
Hardness	Higher	Higher	Higher	Lower [36]	Lower
Heat Build-Up	Lower	Lower	Higher		
Flex Cracking (Aged)	Poorer	Poorer	Better [30]	Poorer [37]	Poorer [42]
Flex Cracking (Unaged)	Poorer [24]	Better [29]	Better	Poorer	Poorer
Abrasion					
aged and unextracted	Lower	Lower	Higher [31]	Higher [39]	Higher [43]
aged and extracted	Lower [25]	Lower	Lower [32]	Higher [40]	Lower [44]

([1]) Hotter for K 60-D 60. ([2]) More for K 77-D 77. ([4]) More for K 77-D 77. ([5]) More for K 77-D 77. ([7]) Poorer for K 77-D 77 and K 60-D 60. ([8]) Higher for Philblack-O. ([10]) Higher for Philblack-O. ([11]) Same for K 77-D 77. ([12]) Same for K 60-D 60. ([13]) Poorer for K 60-D 60 and Statex-K. ([14]) Lower for Statex-K. ([15]) Poorer for K 60-D 60. ([16]) Same for Philblack-O and K 60-D 60. More for Vulcan. ([17]) Lower for K 77-D 77 and Statex-K. ([18]) Better for Philblack-O. ([19]) Hotter for K 77-D 77. ([20]) More for K 77-D 77. ([21]) Less for K 77-D 77 and K 60-D 60. Same for Philblack-O. ([22]) Same for Statex-K and Vulcan. ([23]) Higher for Vulcan. ([24]) Better for K 77-D 77 and Philblack-O. ([25]) Higher for K 60-D 60. ([26]) More for Statex-K. ([27]) Same for Philblack-O and Statex-K. ([29]) Poorer for K 77-D 77 and Statex-K. ([30]) Poorer for Philblack-O and Statex-K. ([31]) Lower for K 60-D 60. ([32]) Higher for Philblack-O. ([33]) More for K 77-D 77 and Philblack-O. ([34]) Less for K 77- D 77. ([35]) Higher for Philblack-O. ([36]) Same for Philblack-O. ([37]) Better for Philblack-O. ([38]) Higher for K 60-D 60. ([39]) Lower for Statex-K. ([40]) Lower for K 77-D 77 and Statex-K. ([42]) Better for Philblack-O. ([43]) Lower for K 60-D 60 and Vulcan. ([44]) Same for Vulcan. Higher for K 60-D 60.

Conclusion

An attempt has been made to study the processing and reinforcement characteristics of natural rubber and of GR-S made at 122°, 41°, 14°, and 0° F., compounded with various carbon blacks. There may be fewer problems involved in the processing of low temperature GR-S after standardization in its manufacture with respect to reaction temperatures, modifiers, short-stops, emulsifiers, and viscosities. There is also the likelihood that, in order to achieve easier processing of low temperature GR-S, the highly reinforcing carbon blacks may have to be blended with those of less reinforcement but of better processing. Under the circumstances there would be some sacrifice in residence to abrasion, but it is expected that the abrasion results will still be at a higher level than is experienced with regular GR-S. The development of suitable carbon blacks for "cold rubber," to make possible easy processing and high resistance to abrasion, is now well on the way.

ACKNOWLEDGMENT

The authors express their appreciation to the members of the laboratory staff of the United Carbon Company, Inc., at Charleston, West Virginia, and at Borger, Texas, for their help in obtaining the test data.

Some of the processing and reinforcement characteristics of low temperature GR-S with various carbon blacks, as discussed in the foregoing article, are presented graphically in 54 charts on the next nine pages.

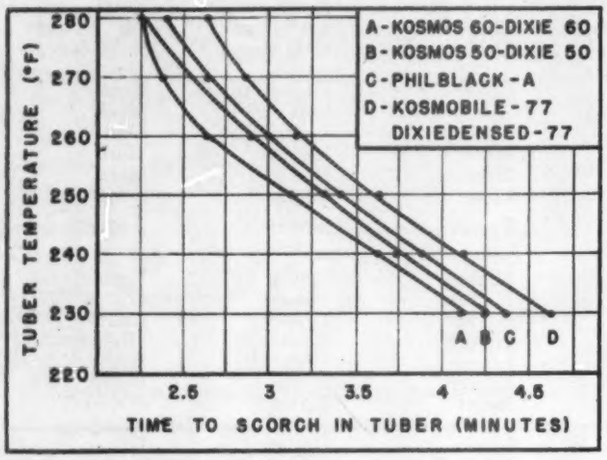

FIG. 1

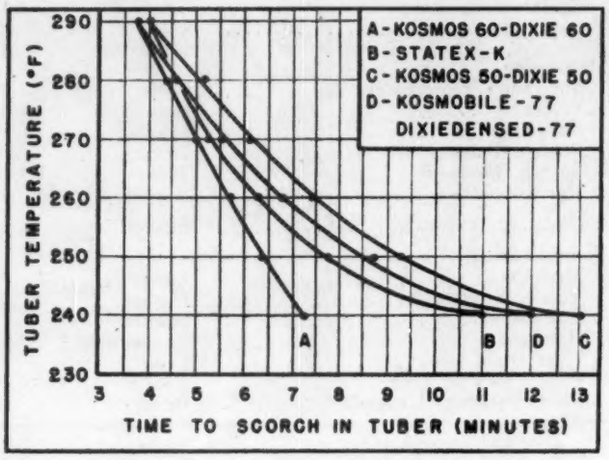

FIG. 4

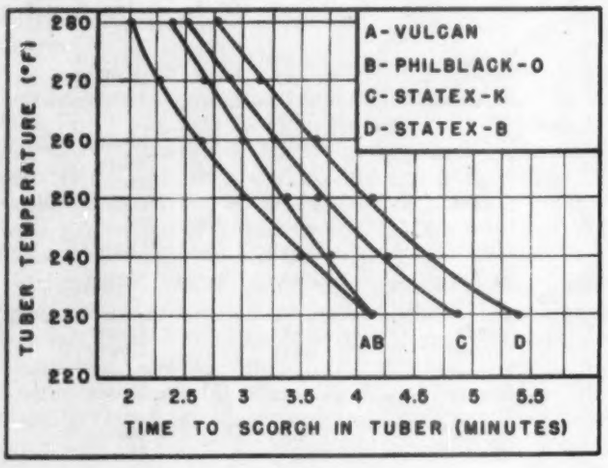

FIG. 2

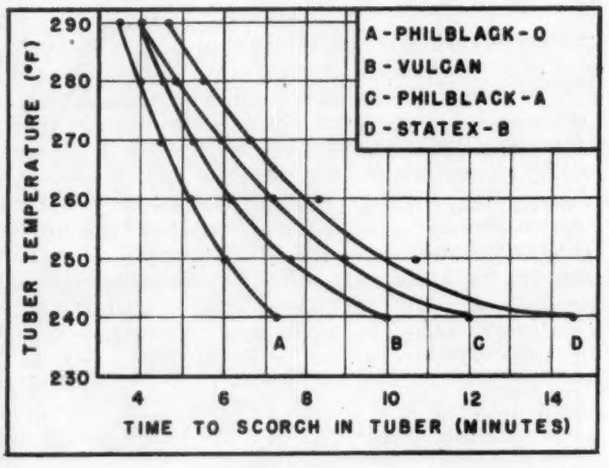

FIG. 5

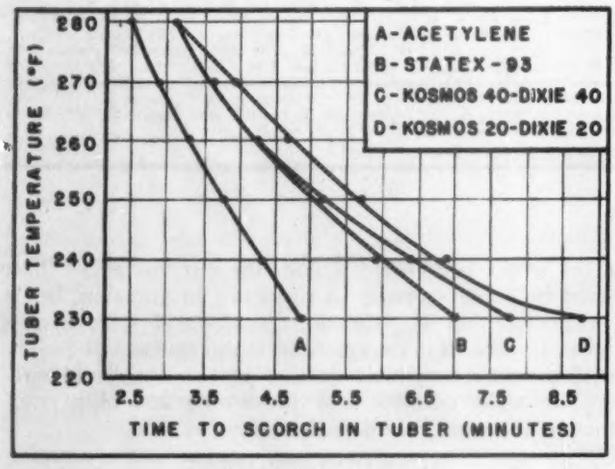

FIG. 3

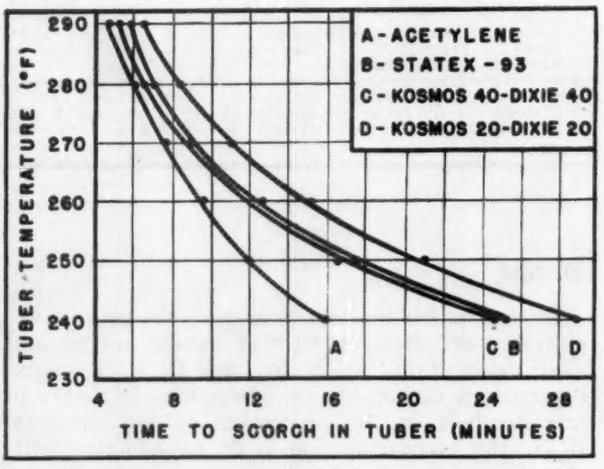

FIG. 6

FIGS. 1, 2, and 3—Tuber scorch time of natural rubber, compounded with various carbon blacks. FIGS. 4, 5, and 6—Tuber scorch time of GR-S-10, compounded with various blacks.

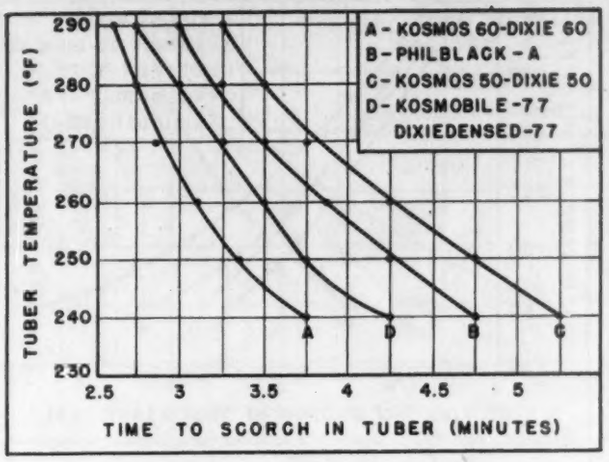

FIG. 7

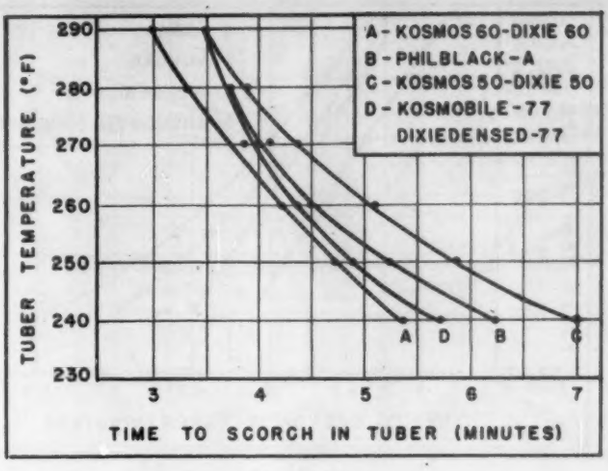

FIG. 10

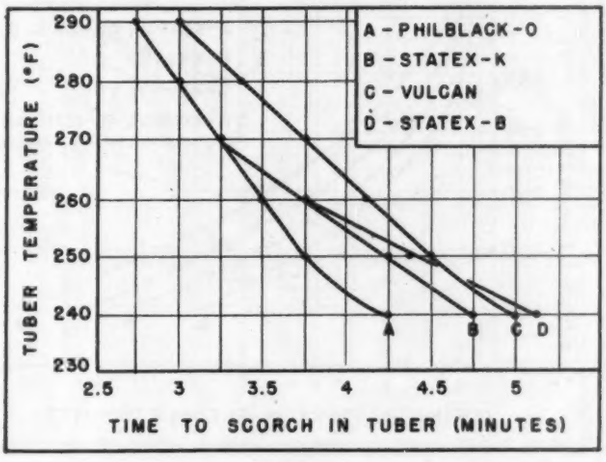

FIG. 8

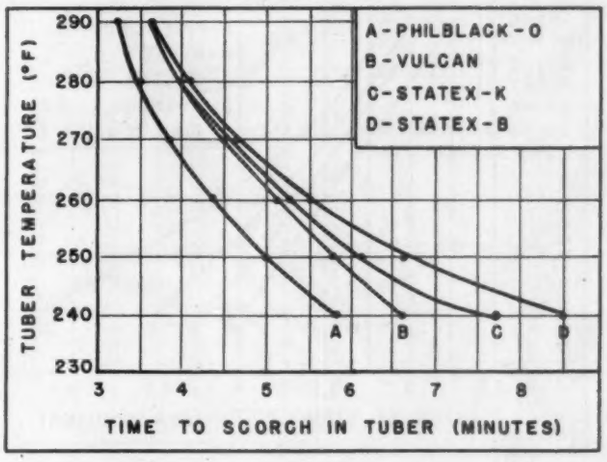

FIG. 11

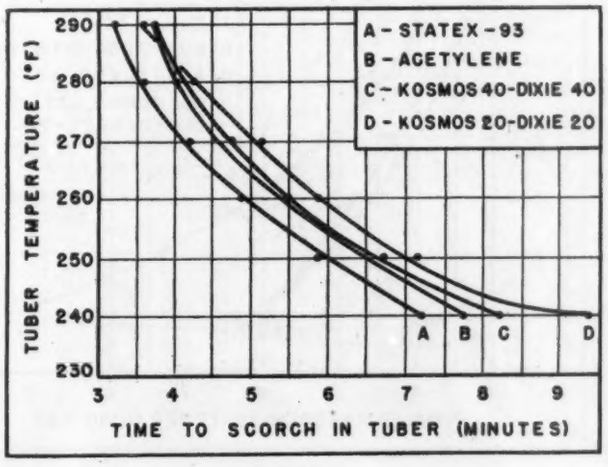

FIG. 9

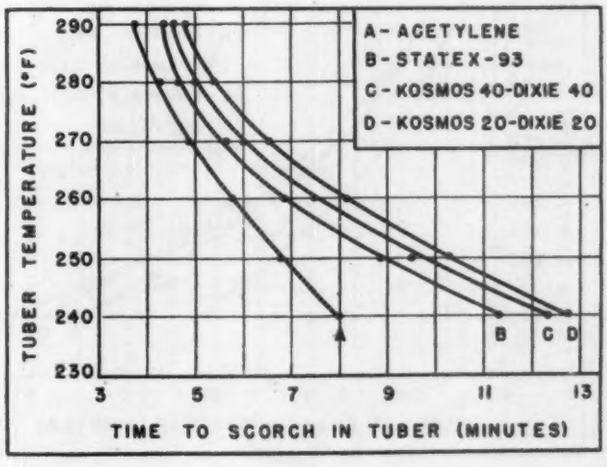

FIG. 12

FIGS. 7, 8, and 9—Tuber scorch time of X-435 (41° F. and 67 Mooney), compounded with various carbon blacks. FIGS. 10, 11, and 12—Tuber scorch time of X-485 (41°F. and 55 Mooney), compounded with various carbon blacks.

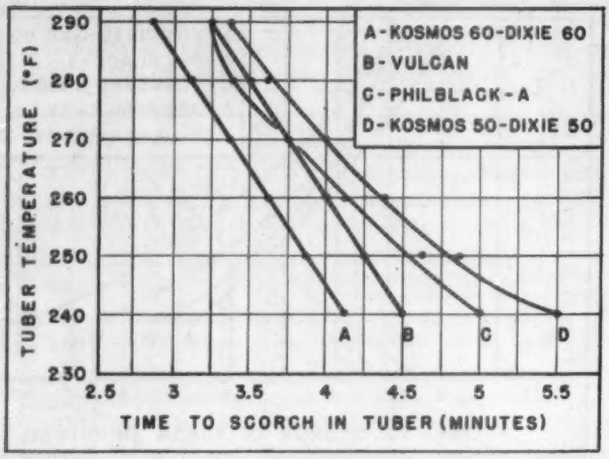

FIG. 13

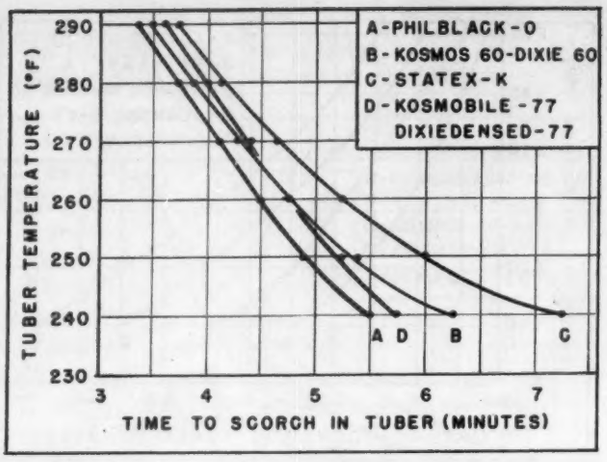

FIG. 16

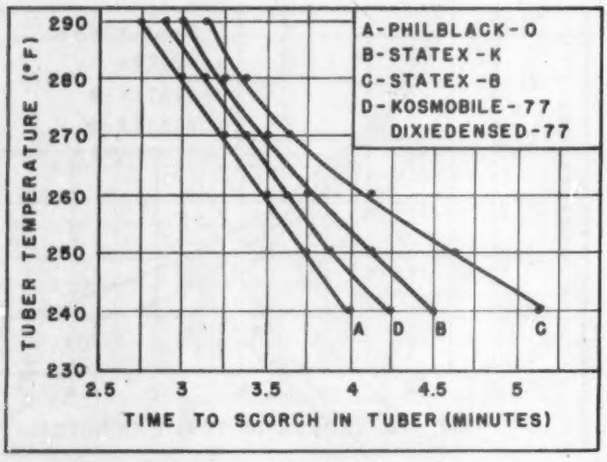

FIG. 14

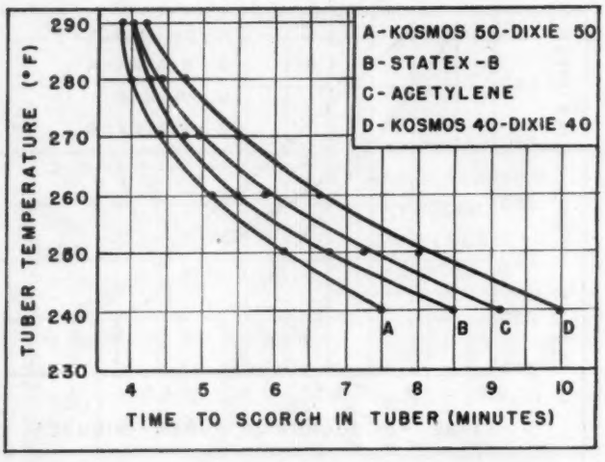

FIG. 17

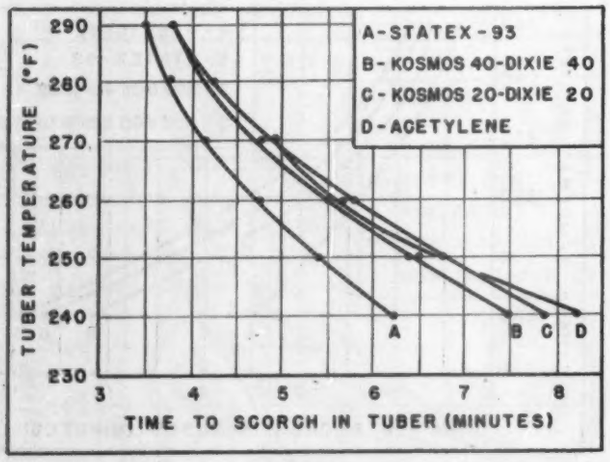

FIG. 15

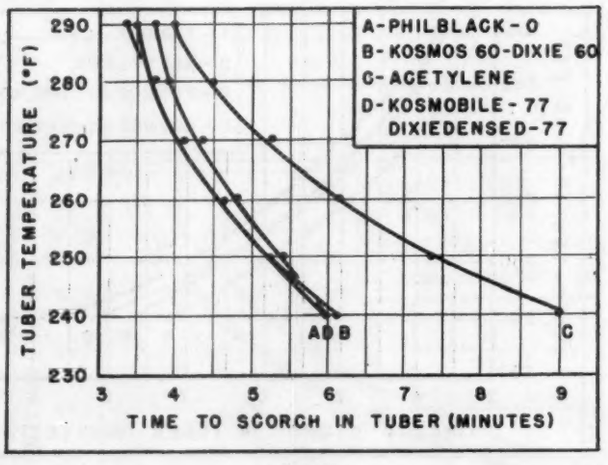

FIG. 18

FIGS. 13, 14, and 15—Tuber scorch time of X-463 (14° F. and 70 Mooney), compounded with various carbon blacks. FIGS. 16 and 17—Tuber scorch time of X-464 (0° F. and 38 Mooney), compounded with various carbon blacks. FIG. 18—Tuber scorch time of X-464 (0° F. and 42 Mooney), compounded with various carbon blacks.

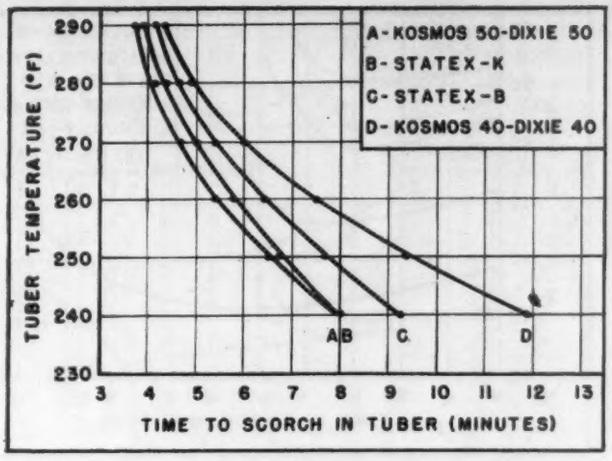

FIG. 19

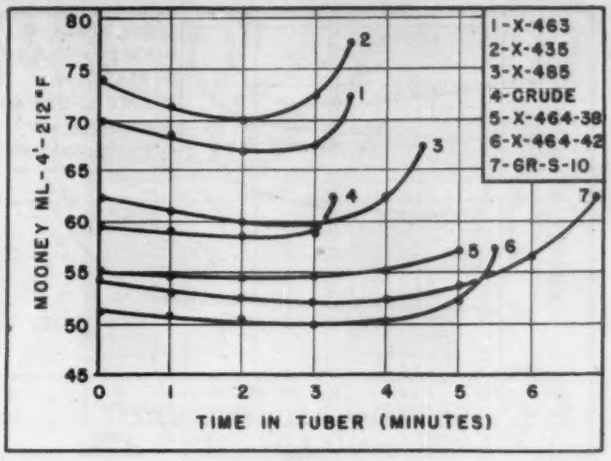

FIG. 22

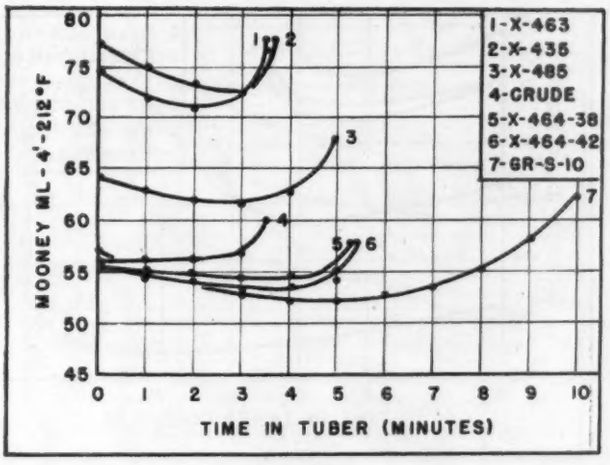

FIG. 20

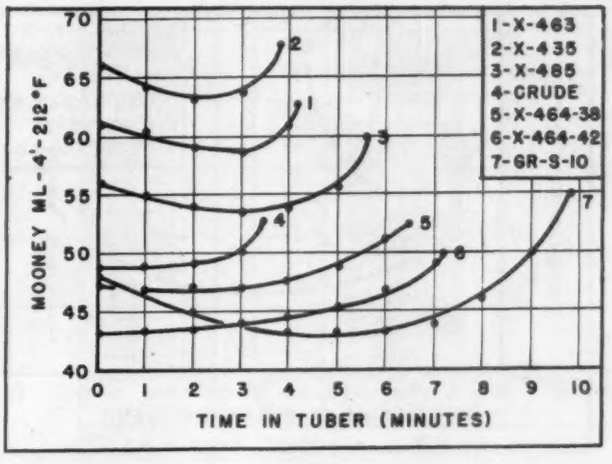

FIG. 23

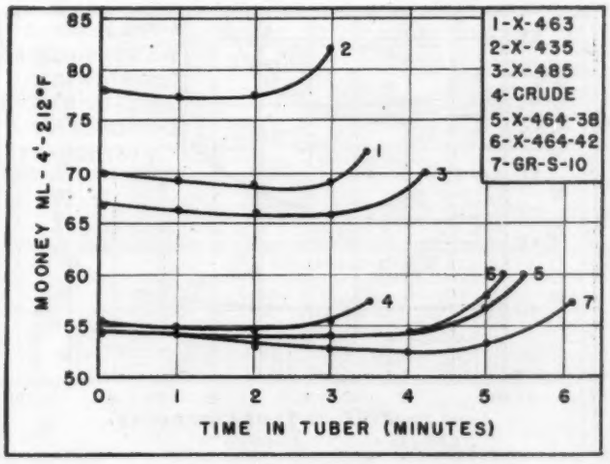

FIG. 21

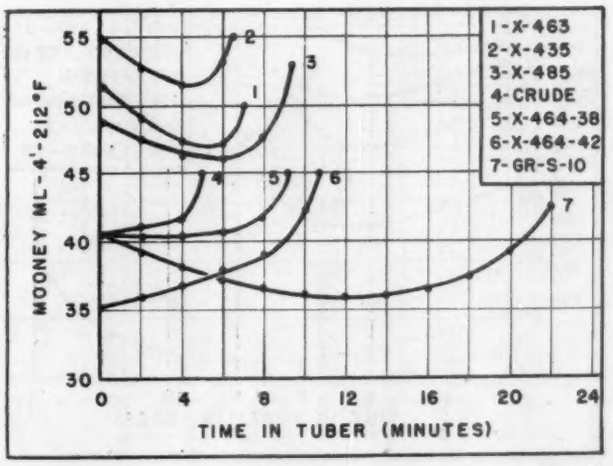

FIG. 24

FIG. 19—Tuber scorch time of X-464 (0° F. and 42 Mooney), compounded with various carbon blacks. FIGS. 20, 21, 22, 23, and 24—Mooney viscosity of seven rubber stocks upon prolonged mastication in the tuber at 240° F. (Fig. 20 is for Kosmobile 77-Dixiedensed 77; Fig. 21, for Kosmos 60-Dixie 60; Fig. 22, for Philblack-O; Fig. 23, for Statex-K; and Fig. 24, for Kosmos 40-Dixie 40).

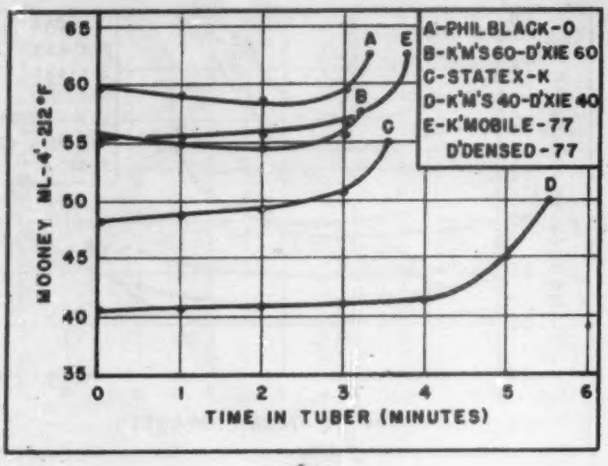

FIG. 25

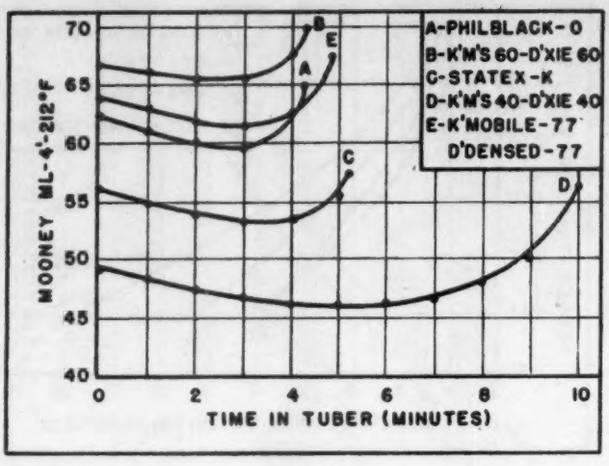

FIG. 28

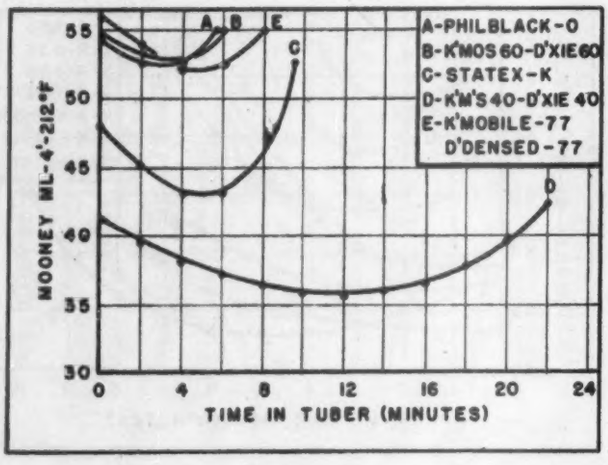

FIG. 26

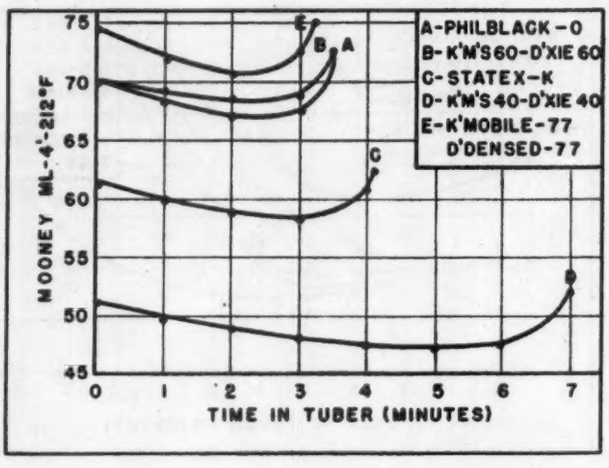

FIG. 29

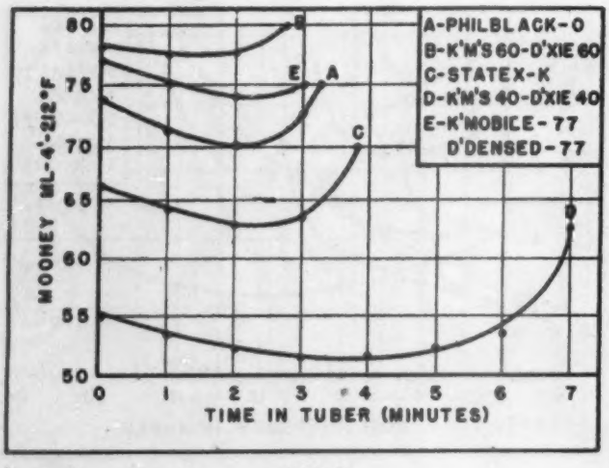

FIG. 27

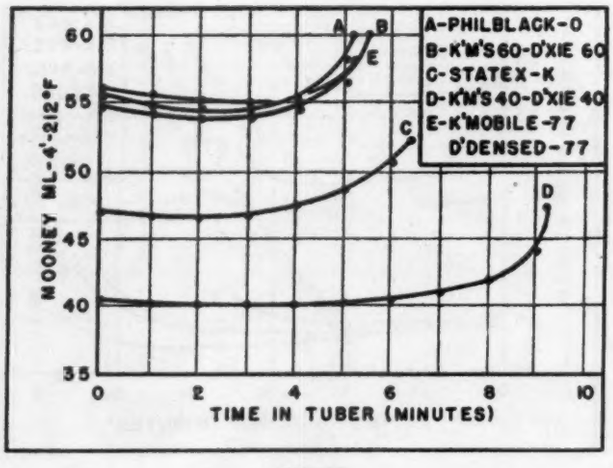

FIG. 30

FIGS. 25, 26, 27, 28, 29, and 30—Mooney viscosity of six rubber stocks upon prolonged mastication in the tuber at 240° F. [Fig. 25 is for natural rubber; Fig. 26, for GR-S-10; Fig. 27, for X-435 (41° F. and 67 Mooney); Fig. 28, for X-485 (41° F. and 55 Mooney); Fig. 29, for X-463 (14° F. and 70 Mooney); and Fig. 30, for X-464 (0° F. and 38 Mooney)].

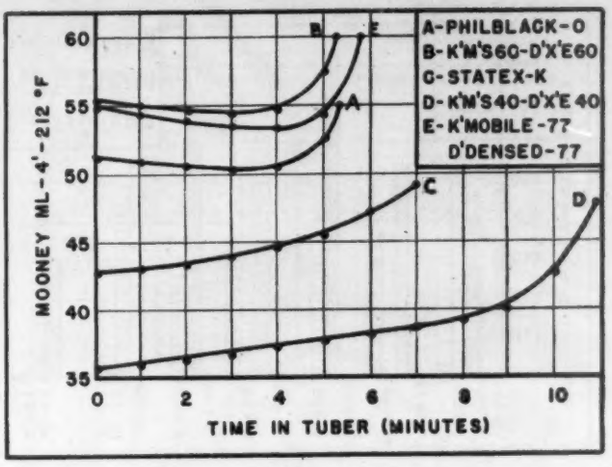

FIG. 31

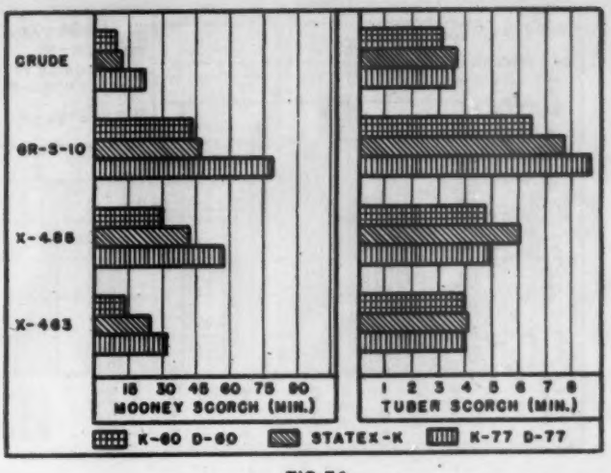

FIG. 34

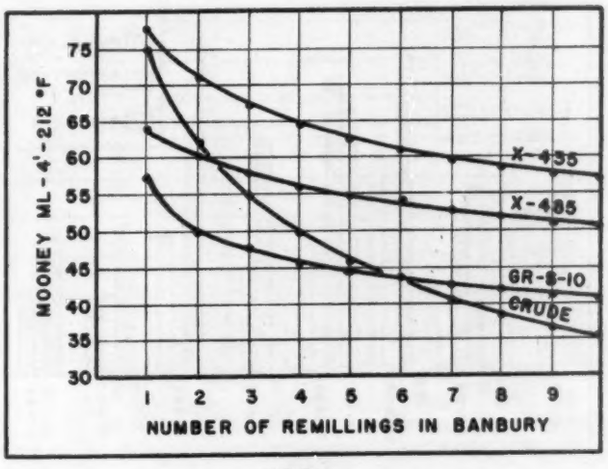

FIG. 32

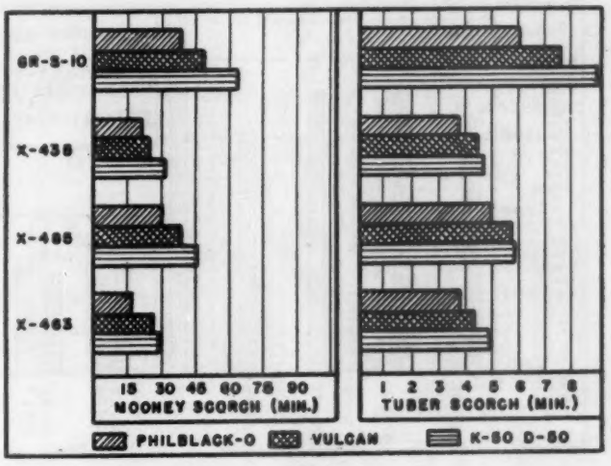

FIG. 35

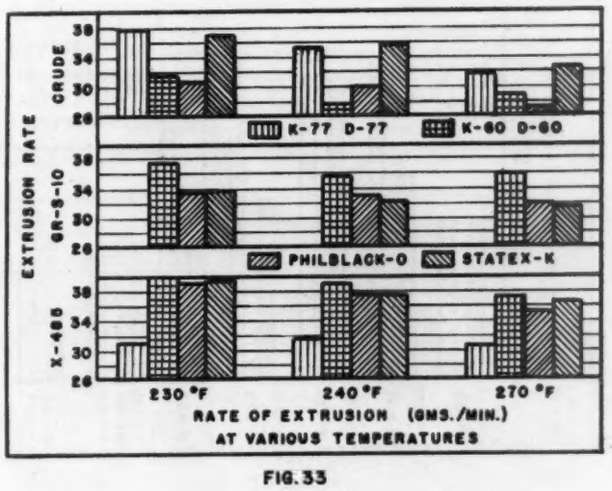

FIG. 33

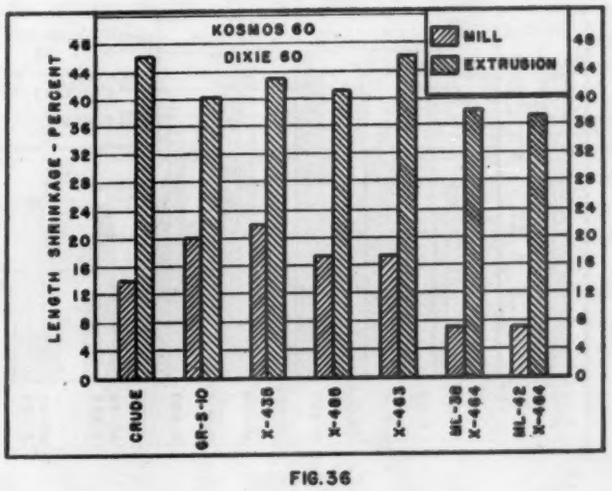

FIG. 36

FIG. 31—Mooney viscosity of X-464 stocks upon prolonged mastication in the tuber at 240° F. FIG. 32—Mooney viscosity of four rubbers, each compounded with Kosmos 60-Dixie 60 and remilled ten times for five-minute periods in the Banbury. FIG. 33—Extrusion rate at various temperatures of three rubbers, compounded with various carbon blacks. FIGS. 34 and 35—Relationship between tuber scorch time and Mooney scorch time at 250° F. for four rubbers, compounded with various carbon blacks. (Fig. 34 is for Kosmos 60-Dixie 60, Statex-K, and Kosmobile 77-Dixiedensed 77. Fig. 35 is for Philblack-O, Vulcan, and Kosmos 50-Dixie 50). FIG. 36—Relationship between length shrinkage of mill and extruded stock for various rubbers, compounded with Kosmos 60-Dixie 60.

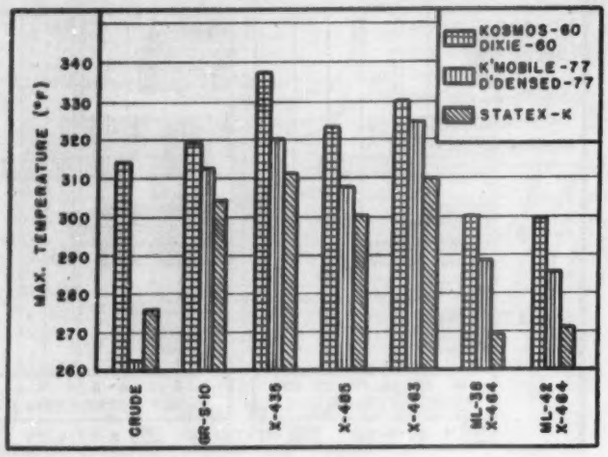

FIG. 37

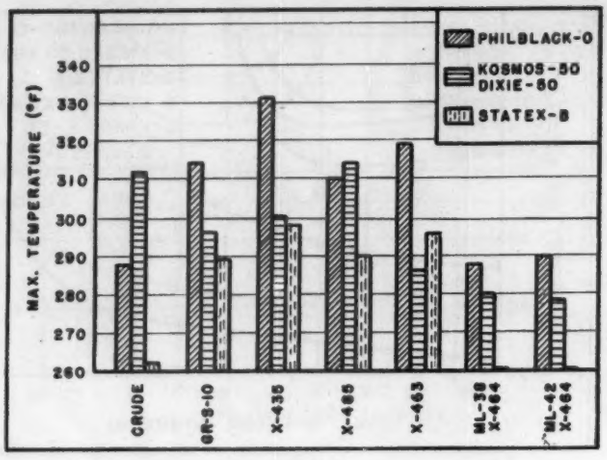

FIG. 38

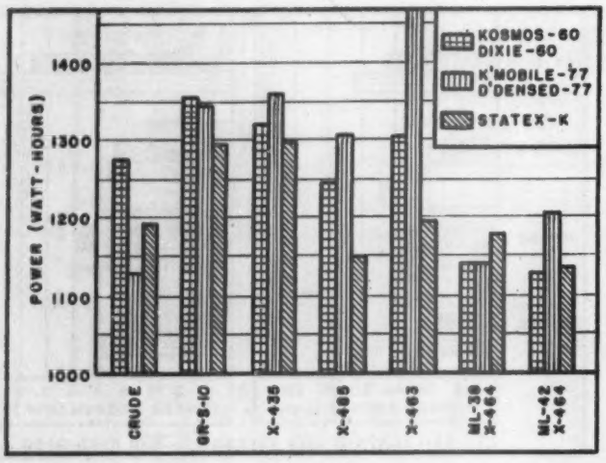

FIG. 39

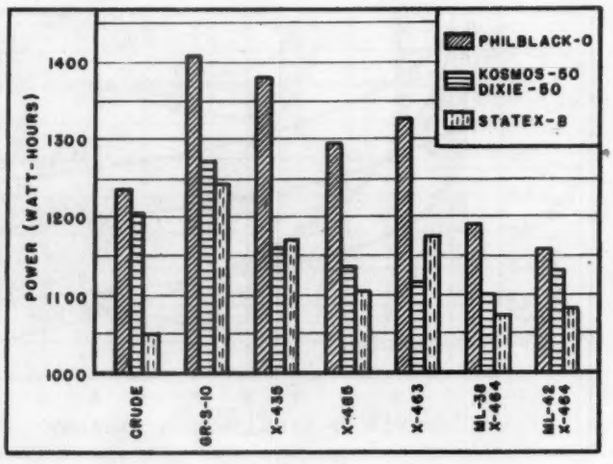

FIG. 40

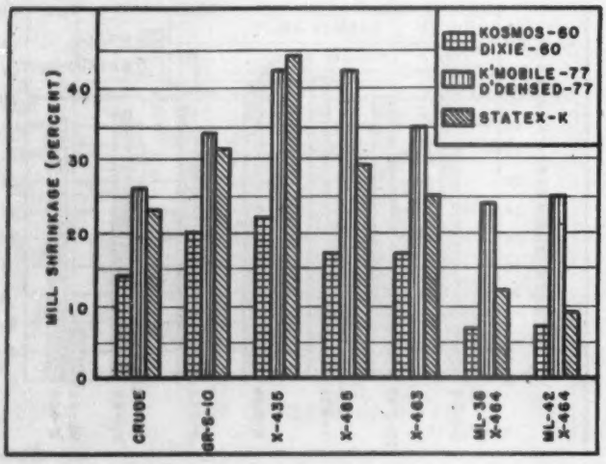

FIG. 41

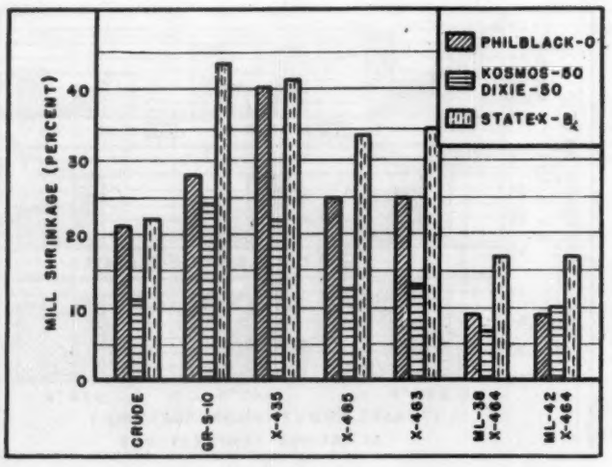

FIG. 42

FIGS. 37 and 38—Maximum temperatures attained in the Banbury during the milling of various rubbers, compounded with various carbon blacks. (Fig. 37 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 38 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B). FIGS. 39 and 40—Power consumed in the Banbury milling of various rubbers, compounded with various carbon blacks. (Fig. 39 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 40 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B). FIGS. 41 and 42—Per cent shrinkage (mill) of various rubbers, compounded with various carbon blacks. (Fig. 41 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 42 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B).

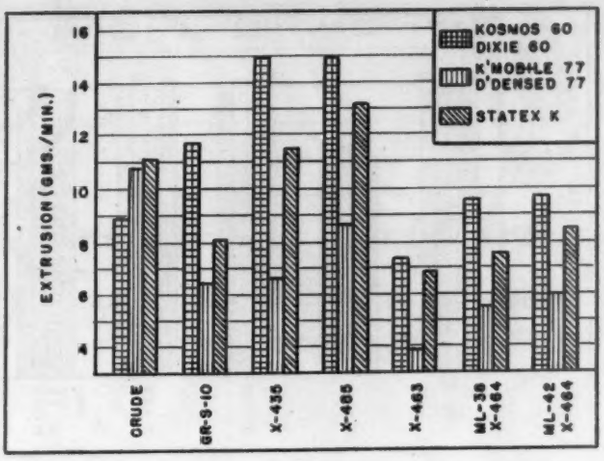

FIG. 43

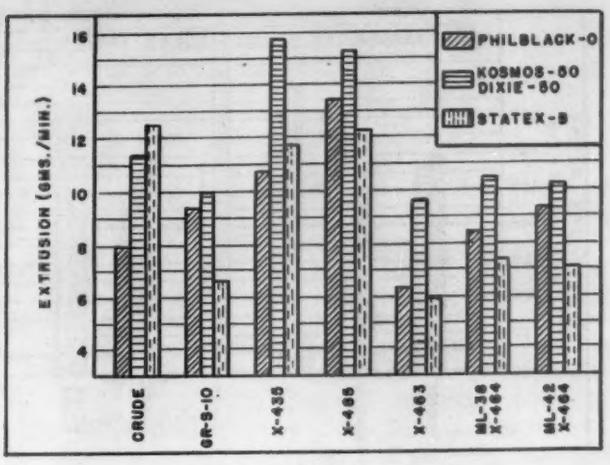

FIG. 44

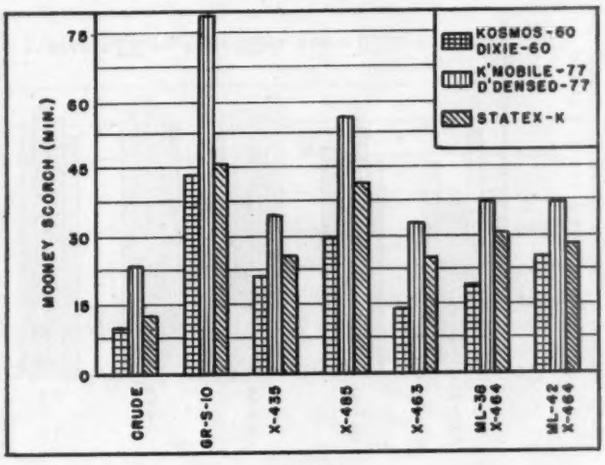

FIG. 45

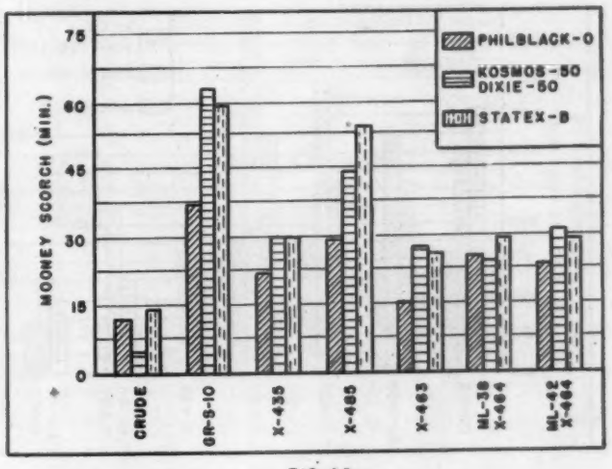

FIG. 46

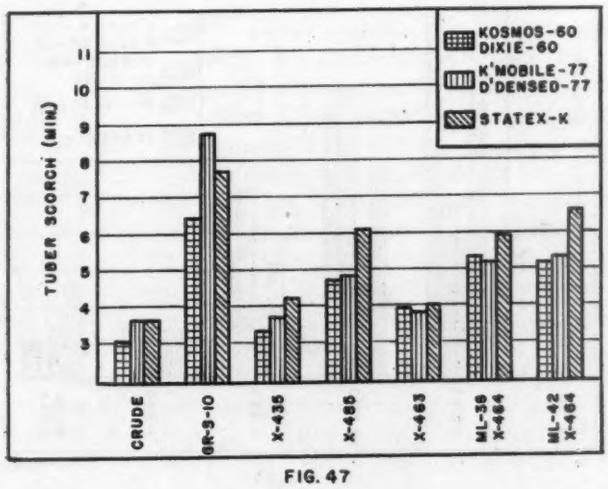

FIG. 47

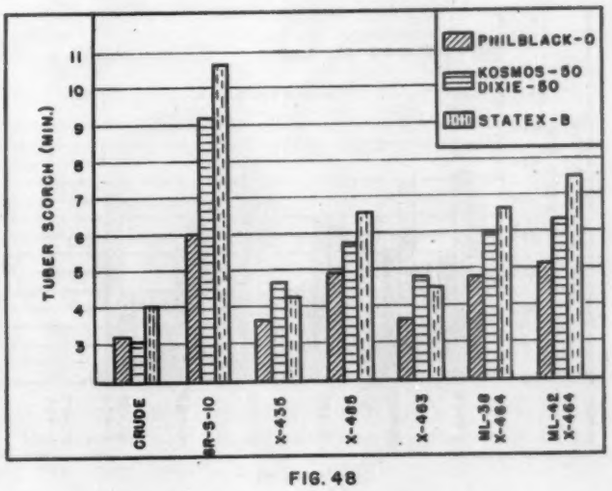

FIG. 48

FIGS. 43 and 44—Extrusion rate of various rubbers, compounded with various carbon blacks. (Fig. 43 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 44 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B). FIGS. 45 and 46—Mooney scorch time at 250° F. of various rubbers, compounded with various carbon blacks. (Fig. 45 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 46 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B). FIGS. 47 and 48—Tuber scorch time at 250° F. of various rubbers, compounded with various carbon blacks. (Fig. 47 is for Kosmos 60-Dixie 60, Kosmobile 77-Dixiedensed 77, and Statex-K; Fig. 48 is for Philblack-O, Kosmos 50-Dixie 50, and Statex-B).

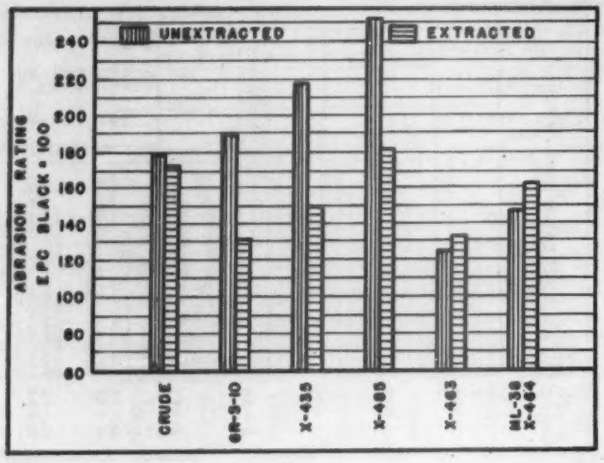

FIG. 49

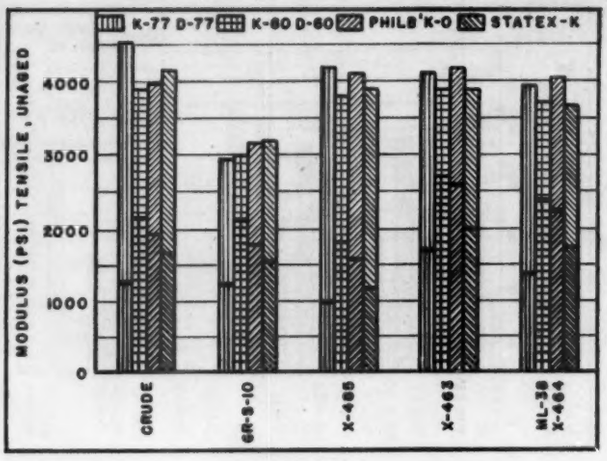

FIG. 52

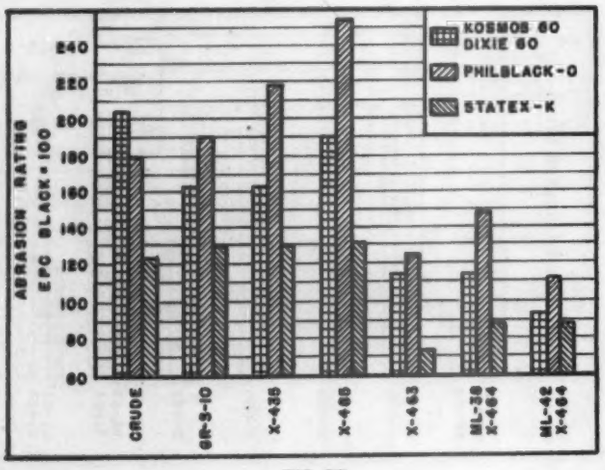

FIG. 50

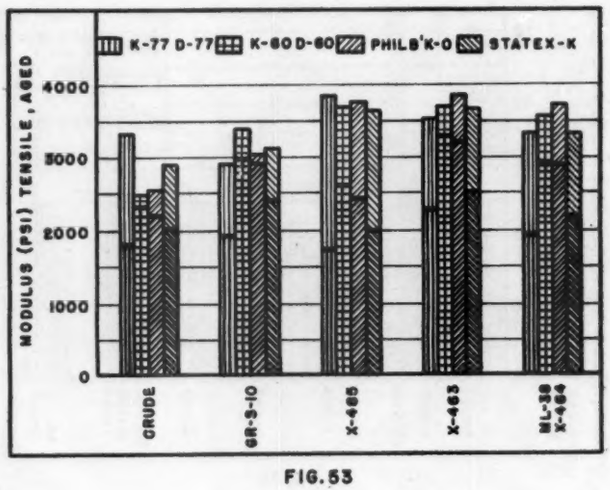

FIG. 53

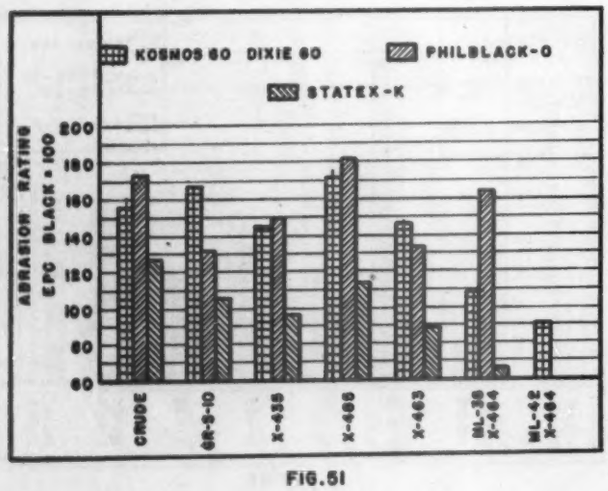

FIG. 51

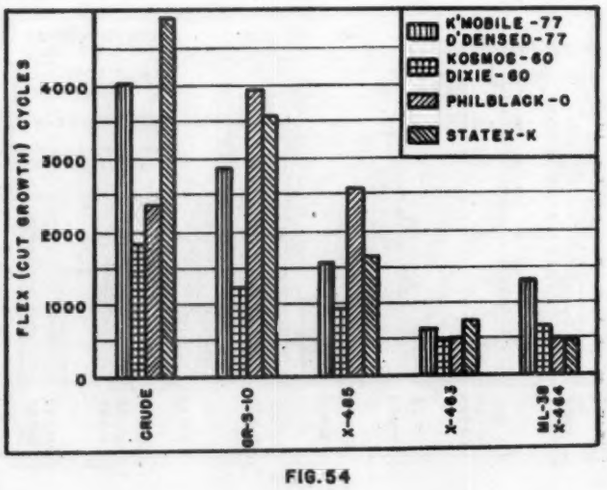

FIG. 54

FIG. 49—Abrasion rating of aged rubbers (unextracted and extracted), compounded with Philblack-O. FIGS. 50 and 51—Abrasion rating of aged rubbers (unextracted and extracted), compounded with Kosmos 60-Dixie 60, Philblack-O, and Statex-K. (Fig. 50 is for unextracted rubbers; Fig. 51 is for the extracted rubbers). FIGS. 52 and 53—Modulus and tensile strength at break of various rubbers (unaged and aged), compounded with Kosmobile 77-Dixiedensed 77, Kosmos 60-Dixie 60, Philblack-O, and Statex-K. (Fig. 52 is for the unaged rubbers; Fig. 53 is for the aged rubbers). FIG. 54—Flex cut growth of various aged rubbers, compounded with various carbon blacks.

Editorials . . . . . .

Season's Greetings

WITH each passing year the pleasure we derive from being an active part of the rubber industry increases. Within a few weeks we shall cross the threshold of a new year, and as 1949 unfolds we hope it will be filled with good health, happiness and prosperity for all of our good friends.

THE PUBLISHERS

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Trend of Consumption

THE USE of chemical (synthetic) rubber is mandatory only in transportation products, in accordance with the provisions of Rubber Order R-1. Its use in non-transportation goods, therefore, is a fair indication of the ability of the chemical rubbers to stand up in competition with natural rubber. A diagnosis of the current usage of chemical rubbers recently prepared by E. G. Holt of the Rubber Unit of the Department of Commerce is therefore of great interest.

According to Mr. Holt's figures, the consumption of rubber in transportation goods in the United States during the first nine months of 1948 declined 7.1% below the corresponding 1947 period, while consumption for other uses increased by 14.4%. Chemical rubbers used in non-transportation products in the 1948 period accounted for 32.36% of the total of chemical rubber consumed, as compared with 30.7% in the year of 1947. It is noted, however, that natural rubber used in the same products in the 1948 period accounted for 27.74% of total consumption of natural rubber as compared with only 21.3% in 1947.

Of the chemical rubbers, GR-S showed a slight rise in the 1948 period in the non-transportation field, accounting for 29.67% of total GR-S consumption as compared with 28.7% in 1947. The use of reclaim in the same field showed a decline, from 59.6% in 1947 to 57.9% in the 1948 period. The figures indicate that natural rubber is gaining in the field of voluntary use at the expense of GR-S and reclaim, raising a question as to how much voluntary consumption of GR-S can be relied upon for a long term.

Plant Disposition

THE announcement of the sale of the government-owned neoprene plant at Louisville, Kentucky, to the DuPont organization, as reported elsewhere in this issue, brings to the fore the disposition of the additional synthetic rubber plants owned and controlled by the government. Since neoprene is categoried as a special purpose synthetic, the sale of the Louisville facilities was permissible under existing legislation. Disposition of the plants producing general purpose synthetic is somewhat more complicated.

It will be recalled that Public Law No. 469 (Section 9) specified that a study be undertaken to determine and formulate a program for the disposal to private industry by sale or lease of the government-owned rubber producing facilities other than those authorized to be disposed of pursuant to specific sections of the act, or, in plainer terms, those plants not producing general purpose synthetic. Furthermore, that the disposal program resulting from the study shall be given to the President and to Congress not later than April 1, 1949, and that on or before January 15, 1950, the President shall recommend disposal legislation to Congress. The intent of the law is to dispose of the plants by the 1950 date.

At the time the President designated the Reconstruction Finance Corporation to undertake the study for disposal as required by the law, he requested that RFC furnish him with the results of its study at least two months before the April 1, 1949, date, presumably to give him time to study the report and reconcile any differing views before placing the report before Congress. According to the latest reports from Washington, it is extremely doubtful whether RFC will be able to meet the time-table set by the President, although it is planning to meet the April deadline.

It is known that RFC has asked several hundred companies to express their views on plant disposal, but up to the present dozens of these companies have failed to file any suggestions with the various working committees and the government agency is nowhere near the point where it can formulate an over-all disposal program. It is the feeling of the industry, however, that key government officials are determined to remove the government from the synthetic rubber field as early as possible and that actual disposition of the production facilities will be achieved well in advance of the 1950 deadline.

CURRENT NEWS OF THE MONTH

RUBBER DIVISION HOLDS ITS 53RD MEETING; HOWARD CRAMER ELECTED CHAIRMAN FOR 1949

THE Division of Rubber Chemistry, A.C.S., held its Fall Meeting at the Book-Cadillac Hotel in Detroit, Mich., from November 8 to 10, with approximately 700 members and guests in attendance. The meeting was the 53rd held by the Division and marked its 29th anniversary. Features of the meeting included the presentation of twenty-two technical papers, announcement of 1949 officers, a business session, the divisional banquet, and a meeting of the 25-Year Club. Abstracts of the papers appeared in our October, 1948, issue.

Based on a letter ballot, Howard I. Cramer, director of development of Sharples Chemicals Inc., Philadelphia, Penna., was elected chairman for the 1949 season. F. W. Stavely, director of research of the Firestone Tire & Rubber Co., Akron, was chosen as chairman-elect. Charles R. Haynes, manager of rubber service of the Binney & Smith Co., New York, and C. W. Christensen, sales manager of the Rubber Service Laboratories of the Monsanto Chemical Co., Akron, were re-elected secretary and treasurer, respectively. G. H. Swart, director of research of the General Tire & Rubber Co., Akron, was elected a director.

In addition, twelve divisional directors were elected, representing areas in which sponsored local rubber groups are located. These were: *Akron,* J. R. Moore (Harwick Standard Chemical); *Boston,* J. T. Blake (Simplex Wire); *Buffalo,* J. Augenstein (U. S. Rubber Reclaiming); *Chicago,* C. E. Frick (Van Cleef Bros.); *Connecticut,* F. L. Holbrook (Naugatuck Chemical); *Detroit,* J. W. Temple (U. S. Rubber); *New York,* J. E. Waters (General Cable); *Northern California,* R. R. James (Mare Island Rubber Laboratory); *Philadelphia,* W. B. Dunlap, Jr. (Lee Tire); *Rhode Island,* D. C. Scott, Jr. (Scott Testers); *Southern Ohio,* S. L. Brams (Dayton Chemical Products); *Los Angeles,* D. C. Maddy (Harwick Standard Chemical). In addition, Harry E. Outcault (St. Joseph Lead), the retiring chairman, also becomes a member of the board of directors.

Report on Business Session

The business meeting was held on the morning of the second day, with Chairman Outcault presiding. Mr. Outcault reported that the rubber library sponsored by the Division at Akron University was making steady progress, and again urged the membership to take advantage of the opportunities offered by the library. He also reported that the 1942-43 Bibliography of Rubber Literature would be published close to the turn of the year. Progress was also being made with the monograph on synthetic elastomers which, he stated, would probably run close to 1,000 pages and would be sold at approximately $10.00 per copy.

For the past several years the Division has been a joint sponsor of the High Polymer Forums presented at the semi-annual meetings of the parent society. Several papers by rubber technologists which might ordinarily be presented before Division meetings have been given at these forums. For this reason, among others, the Executive Committee, it was reported, has decided to withdraw its sponsorship of the forums, effective with that scheduled for 1950.

Chairman Outcault reviewed efforts made by the Division to secure more prompt publication of papers presented at Division meetings in the various official journals of the parent society, particularly in *Industrial & Engineering Chemistry,* as well as those designed to secure more prompt release for publication in non-society journals. Considerable progress on both of these scores were made during the past year, to the benefit of all authors. It was also announced that the 1949 Spring Meeting of the Division would be held at the Hotel Statler in Boston, Mass., from May 23 to 25, and that the Fall Meeting would be held in Atlantic City, in conjunction with the 116th National Meeting of the A.C.S., with headquarters probably at the Chalfonte-Haddon Hall.

Other features at the business session included a report from the Membership Committee, headed by J. C. Richards, Jr. (Goodrich Chemical). Mr. Richards reported that in the past year the committee had secured 225 new regular Division members and 65 associate members. In addition, 39 full members of the A.C.S. were secured. The report of the Ballot Committee, of which R. G. Seaman (*India Rubber World*) was chairman, was also given. In addition to the officers listed above, it was reported that Seward G. Byam (DuPont) was named as Councillor to represent the Division at A.C.S. meetings, with R. A. Schatzel (Rome Cable) as alternate.

Meeting of 25-Year Club

A special luncheon meeting of the 25-Year Club was held at noon on November 8, with W. G. Nelson (U. S. Rubber) presiding as chairman, and with 108 members in attendance. Brief addresses were made by Mr. Nelson, H. A. Winkelmann (Dryden Rubber), one of the prime exponents of the club, and Harry Outcault. Several members with long-time tenures in the rubber industry were introduced, including Bill Higgins (1902), Charley Haynes (1904), H. Fuller (1904), and Ban Henderson (1906).

Bruce Silver (N. J. Zinc), as chairman of the Eligibility Committee appointed at the previous meeting of the club, reported that the committee had decided that membership in the club should be open to anyone connected with the rubber industry for at least 25 years, but should currently be a member of either the A. C. S. or the Rubber Division. He said the committee also favored circularizing the entire membership of the Division for club membership.

Norman A. Shepard (American Cyanamid), chairman of the Name Committee, reported that the committee favored use of the following name: 25-Year Club, Rubber Division, A.C.S. Reports of both the eligibility and name committees were approved. It was also announced that the next meeting of the club would be held during the Division meeting in Boston next May, with John Bierer (Boston Woven Hose) as chairman.

Other Meeting Highlights

Another highlite of the Detroit meeting was the Division banquet, held on the evening of the second day. An unexpected pleasure was a brief, unscheduled, off-the-record talk by K. T. Keller, president of the Chrysler Corporation. Mr. Keller first welcomed the members of the rubber industry to the automotive center of the world, and then launched into a humorous discussion of the mutual problems of both industries, sprinkling his talk with anecdotes. Some excellent entertainment was offered after the banquet.

Arrangements at the Detroit meeting flowed smoothly, due to the excellent work of the local arrangements committee, headed by C. W. Selheimer (U. S. Rubber) as chairman and W. B. Davies as vice-chairman. Thanks are also due to the chairmen of various committees, as follows: *Registration,* J. W. Temple (U. S. Rubber); *Finance,* E. J. Kvet (Baldwin Rubber); *Banquet,* G. M. Wolf (Sharples Chemicals); *Meeting Rooms,* G. R. Cuthbertson; *Information,* G. F. Lindner (Minnesota Mining).

Move New York Offices

The Metropolitan New York sales office of the General Latex and Chemical Corp. has been moved to Suite 1803, 347 Madison Ave., New York 17, N. Y. The new telephone number is MUrray Hill 4-1161. The new location is most convenient for anyone passing through the Grand Central area.

OCTOBER RUBBER CONSUMPTION SHOWS DROP FROM SEPTEMBER

New rubber consumed in the United States in October amounted to 88,028 long tons compared with 91,346 tons in September and 102,954 tons in October 1947, according to preliminary statistics released by the Department of Commerce. For the first 10 months of 1948, new rubber consumption totaled 903,032 tons, a decline of 3.1 percent from the 931,646 tons consumed in the corresponding period of 1947, the Rubber Division, Office of Domestic Commerce, said.

Natural rubber consumption was 49,723 tons in October, the second lowest figure for the year to date. However, latex consumption, included in this figure, was 2,448 tons, the second highest of the year. Synthetic rubber consumption totaled 38,305 tons, and included 29,108 tons of GR-S, 5,130 tons of butyl, 3,160 tons of neoprene, and 907 tons of N-type. N-type consumption was the highest since May, 1945.

The ratio of GR-S consumption increased again in October, amounting to 36.9 percent of total natural plus GR-S, and 33.1 percent of total new rubber. Both ratios were at their highest point since January. Use of N-type reached 1 percent of total new rubber consumption for the first time since July, 1945.

Natural rubber imports, rebounding from the low September figure of 50,556 tons, amounted to 60,997 tons in October, and included 2,728 tons of latex. Malaya, as usual, was the chief source, accounting for 57 percent of the imports, but receipts from the Netherlands Indies, Siam, and Ceylon continued at a high level.

Production of synthetic rubber totaled 41,419 tons in October, a level of about 740 tons above that averaged in the first 9 months of the year. Output of butyl, with the Baytown plant restored to production, amounted to 6,017 tons, the highest output since May 1947. N-type production, at 977 tons, was the highest since April 1945. Output of GR-S, still lagging on the West Coast, was 31,148 tons, the lowest in the last 8 months. Neoprene production remained at a high level.

Production of reclaim was reported at 23,854 tons in October, and consumption at 22,959 tons. Stocks at the end of October were reported at 31,339 tons, an increase of 1,141 tons over the previous month.

Reported stocks of new rubber available to industry at the end of October were, in long tons: Natural 118,658 (including 11,404 tons of latex), GR-S 87,307, butyl 7,925, neoprene 5,121, and N-type 2,331. Comparable stocks at the end of September in the same order were: 123,912, (10,823), 84,318, 6,541, 4,986, and 2,401.

Ferro Names Hodges-Truesdale

The Ferro Chemical Corp., Cleveland 14, Ohio, has appointed Hodges-Truesdale Co., 152 Sixth St., Cambridge 42, Mass., as sales agent for the New England territory, for the sale of metallic soaps, driers, fungicides, and stabilizers to the rubber, plastic and other industries.

Howard I. Cramer
New Rubber Division Chairman

Wage Policy Under Consideration

According to a statement made by L. S. Buckmaster, president of the United Rubber Workers of America, during the recent CIO convention in Portland, Ore., the wage policy of the rubber union will be determined not later than the end of February, 1949. Mr. Buckmaster expressed the belief that rubber manufacturers can afford new wage raises without increasing prices. He added, however, that there is a great deal of sentiment developing among rubber workers for full pensions and "all the benefits of a health and welfare fund."

Firestone Making Army Rifles

Two new weapons designed by the Ordnance Department of the U. S. Army, are now being mass-produced by the Firestone Tire & Rubber Co., Akron, Ohio. The weapons include a 57 mm. shoulder piece, and a 75 mm. weapon which fires from a standard machine gun tripod. The new weapons are said to embody all the principles of standard field artillery, and are light enough to be carried by two men. The weapons have been designed on principles embodied in the "Bofors" gun used with great success during the recent war.

Approve Aetna Liquidation

The Aetna Rubber Co., Cleveland, Ohio, recently announced that holders of 496 preferred shares which have dividend accumulations of more than $100 a share will receive $100 a share in voluntary liquidation. Philmore J. Haber, secretary of the company, said that out of a total of about 88,000 common shares some 70,000 shares were voted in approval of the company's liquidation. Sales of the company's assets to a group of investors from Akron for $350,000 was recently aproved.

RUBBER HEEL AND SOLE GROUP FORMS RESEARCH ORGANIZATION

Robert A. Winters announced recently that the name of the trade organization of which he is executive director has been changed from the Rubber Heel & Sole Manufacturer's Association to the Rubber Heel and Sole Institute. The new Institute, in turn, has formed the Elastic Colloid Research Corporation which is establishing a laboratory equipped with the latest experimental machinery at the Massachusetts Institute of Technology.

In addition, the corporation has established a graduate fellowship in the field of elastic colloids under the direction of Professor Ernst Hauser, a known authority in the general fields of rubber, plastics and resins. The Institute. is of the opinion that this is an important step in its program to make better products which have greater customer acceptance.

The officers of the Elastic Colloid Research Corporation are: Raymond E. Drake, Avon Sole Co., president; David R. Cutler, Alfred Hale Rubber Co., vice-president; David W. Bernstein, Biltrite Rubber Co., treasurer; Morris Eisen, Cat's Paw Rubber Co., secretary; Kyle L. Menuez, Gro-Cord Rubber Co., assistant treasurer; S. Schwaber, Monarch Rubber Co., director; and Robert A. Winters, Rubber Heel and Sole Institute, assistant secretary.

The principal office of the research corporation is at Avon, Mass., and the Institute's office is at 551 Fifth Avenue, New York City.

DuPont Anti-Trust Inquiry

A Federal grand jury which is conducting an anti-trust investigation of the DuPont industrial empire, as reported in the October issue of RUBBER AGE, has widened its inquiry to include more than sixty companies. The Government is attempting to determine if any tie-up exists between E. I. du Pont de Nemours & Co., Inc., and many other industrial concerns. Records requested by the jury concern purchases, sales, profits and capital stock investments. Subpoenas issued by the jury for records of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., Remington Arms Co., Inc., Bridgeport, Conn., and Kinetic Chemicals, Inc., Wilmington, disclosed the Government's interest in other companies and their possible affiliation with DuPont.

Consolidated Buys Atlas Equipment

The machinery and equipment of the Coated Fabrics Division of the Zapon plant of the Atlas Powder Co. at Stamford, Conn., has been purchased by the Consolidated Products Co., Inc., New York 7, N. Y. Details of the sale, first reported in the October issue of RUBBER AGE, have now been elaborated upon with the announcement that Consolidated has undertaken an intensive campaign towards the liquidation of the machinery in the rubber, plastics, and other industries. The plant was originally installed at a cost of $2,000,000, and occupies 300,000 square feet of floor space.

TALKS ON NON-METALLIC BEARINGS FEATURE ASME RUBBER MEETING

The Rubber and Plastics Division of the American Sociiety of Mechanical Engineers held two technical sessions on November 30 at the Hotel Pennsylvania in New York City, as part of the 69th Annual Meeting of the parent society. Of the series of seven papers presented at morning and afternoon sessions, several were devoted to non-metallic bearings. Approximately 90 members and guests attended the sessions.

The meeting of the Division was presided over by J. F. Downie Smith, Dean of Engineering at Iowa State College, the retiring chairman. Leonard Wood, Chairman of the Rubber Section of the National Bureau of Standards acted as chairman of the morning session, with W. Newlin Keen, of the DuPont Synthetic Rubber Sales Department, as recorder, while Dave Scott, Jr., of Scott Testers, Inc., was chairman of the afteroon session, with E. H. Cunningham, of the Enjay Co., Inc., as recorder.

The business meeting was held in the evening and featured election of officers. D. H. Cornell, of the B. F. Goodrich Research Center at Brecksville, Ohio, was elected chairman for 1949, and F. W. Warner, of the General Electric Co., at Pittsfield, Mass., secretary. Incumbent members of the Executtive Committee include W. Newlin Keen (DuPont) and G. W. Neely (Richardson Co.) M. E. Lerner (RUBBER AGE) was elected as the fifth member of the five-man committee.

Members of the Advisory Commitee for 1949 include Messrs. Richardson, Booth, Riesing, Kline and J. F. Downie Smith, the retiring chairman. Gordon Kline (National Bureau of Standards) was named chairman of the Plastics Papers Committee and R. G. Seaman *(India Rubber World)* chairman of the Rubber Papers Committee. John Delmonte, of the Plastics Industry Technical Institute, was named research secretary. M. E. Lerner (RUBBER AGE) was named chairman of the Publicity Committee.

It was also decided that the Division would not attempt to present a program at the Spring Meeting of the A.S.M.E. which will be held at New London, Conn., on May 2 to 4, but John Delmonte was asked to attempt to put a program together for the semi-Annual Meeting, which will be held in San Francisco from June 27 to 30. The division has tentatively scheduled two sessions for the 1949 Annual Meeting, which will again be held at the Hotel Pennsylvania in New York City from November 27 to December 2. Sessions may also be held at the Fall Meeting, which will be held in Erie, Penna., from September 28 to 30.

Talk on Soft Rubber Bearings

The first paper given at the technical sessions of the Division was on "Soft Rubber Bearings" by A. Bednar, vice-president of Lucian Q. Moffitt, Inc., Akron, Ohio. Mr. Bednar noted that soft rubber and rubber-like synthetic compositions have been used as materials for water lubricated bearings for more than 25 years. They have shown important operating efficiencies and economies in pumping equipment, on marine propeller shafts, dredge cutter-shafts and similar applications, even when severe abrasive conditions exist.

The elasticity of the bearing material, and bearing design, provide good friction characteristics, sound and vibration deadening properties, and abrasion resistanace. Present synthetic materials are oil and heat resistant. Best performance is obtained when good quality non-corrodible shafts and shaft sleeves are present. In extremely abrasive or muddy water, special provisions for water circulation improve performaance. (EDITOR'S NOTE: Mr. Bednar's paper will be published in full in an early issue of RUBBER AGE.)

The second paper, presented by J. W. Stanley, chief engineer of the E. J. Willis Co., New York City, was entitled "Report of Friction Test on Flow Controlled Continuous Film Lubricated Rubber Bearings." Mr. Stanley first explained that the Willis Bearing consists of two main parts, namely, a shaft sleeve, to which is molded the rubber journal, and the outside sleeve, which is inserted in the journal box. The author then discussed tests made on this bearing to determine its merits for underwater operations in abrasive-contaminated water.

With reference to friction, power consumption and wear, three tests were made —a dynamic friction test, a starting friction test, and an accelerated wear test. The results of these tests show that the Willis Bearing has comparatively low friction at low shaft speeds, that as the shaft speed is increased, the friction torque decreases, Mr. Stanley said. The co-efficient of friction at 300 r.p.m. was approximately .04 and at 1000 r.p.m. was .01. The accelerated wear test showed that in a rubber bearing the wear on the bronze component was approximately five times that of the rubber component.

The final paper at the morning session was on "Nylon as a Bearing Material" by R. B. Akin of the DuPont Plastics Division at Arlington, N. J., replacing D. B. Hanson, who was originally scheduled to give the talk. Stressing the point that the data presented was in the nature of a preliminary report of work now progressing on the subject by the Battelle Memorial Institute, Mr. Akin first reviewed the general properties of nylon plastic and then discussed its specific use in bearings.

According to the speaker, nylon bearings are attractive from a cost standpoint, since such bearings can be injection molded to the desired size. Early tests indicated that these bearings could operate without lubrication under mild conditions. Later tests showed that both water and oil lubrication are effective in extending the load and speed capacity.

Characteristics of O-Rings

The first paper at the afternoon session was entitled "Frictional Characteristics of O-Rings with a Typical Hydraulic Fluid." Prepared by L. E. Cheyney, W. J. Mueller, and R. E. Duval, of the Battelle Memorial Institute, Columbus, Ohio, the paper was presented by Mr. Duval. The paper described a method for studying friction of O-ring packings and the effects of several variables, such as pressure, time delay between strokes, squeeze on packings, stroke speed, ring size, and surface finish of the moving metal rod.

Numerous measurements in the range investigated indicate that breakout friction, or rod seizure by the packing at the beginning of a stroke, increases with increased packing squeeze, increased time delay between strokes, increased hydraulic pressure, and increased rod toughness. Running friction, on the other hand, was found to be independent of time delay, but increased with squeeze at higher pressures and with increased roughness of the moving rod.

The final technical paper of the meeting was "Laboratory Testing of Rubber Bearings," prepared by D. H. Cornell and J. R. Beatty, of the B. F. Goodrich Research Center, Brecksville, Ohio, and presented by Mr. Beatty. Stating that rubber bearings have found wide use in marine service and other applications, the speaker explained that these bearings, which are generally lubricated with water, consist of a metal housing with a rubber lining operating on a metal journal. The advantages of such construction were stressed.

Mr. Beatty then discussed various tests which have been developed to measure the important properties with reasonable speed and accuracy on laboratory and full-scale equipment. Research programs planned to utilize these tests have resulted in greatly improved bearings. Wear and co-efficient of friction have been lowered and premature failure and noise found in unusual cases have effectively been eliminated by changes in construction or composition of the bearings.

Rubber and Plastics Reports

The meeting also featured the presentation of the two regular annual reports on advances in rubber and plastics. The report on rubber was prepared by Lois W. Brock, G. H. Swart, and E. V. Osberg, of the General Tire & Rubber Co., Akron, and was presented by Mr. Osberg. Representing one of the most comprehensive of such reports prepared to date, it covered new synthetic rubbers, rubber derivatives, machinery and equipment, processing methods, vulcanizing and compounding, and the use of plastics in conjunction with rubber. (EDITOR'S NOTE: This report will be published in full in our next issue.)

The report on plastics was prepared and delivered by E. L. Kropscott, of the Dow Chemical Co., Midland, Mtch., and covered new uses ranging from musical instruments and a nylon button that requires no sewing, to bearings and gears that need no lubrication.

Among new applications listed by the speaker were vinyl floor tile, plastic containers for rigid packing, disposable nursing bottles, wash basins formed from acrylic sheet, a polymethyl methacrylate used for large outdoor signs, vinyl in sound records, and washing machines made with transparent tubs for demonstrator models.

HIGH LEVEL OF EMPLOYMENT IS PREDICTED FOR INDUSTRY

High level employment in the rubber industry and better tires for car owners in 1949 were predicted by Harvey S. Firestone, Jr., Chairman of the Firestone Tire and Rubber Company, in a statement issued at the completion of the company's fiscal year. "During the past year," Mr. Firestone said, "we continued to produce tires at a capacity rate, and next year we anticipate that the demand for tires will be about the same as in 1948."

In support of his optimistic forecast, Mr. Firestone revealed not only that there are more cars and trucks in service today than ever before, but also that the average annual mileage per vehicle has substantially increased. As a result, the number of replacement tires required for passenger cars is 22.5 percent higher and for trucks and busses 76 percent greater, as compared with 1939. Mr. Firestone expressed his belief that, as a consequence, the high level of tire requirements in 1948 may be regarded as a new post-war normal. He also pointed out that, for the first time since 1940, inventories of tires are approaching a balance with sales requirements.

"Safer, longer-wearing tires in 1949 are assured by a number of new developments which have been perfected by the rubber industry. One of the most important of these is the production of synthetic rubber by the new cold process. Tires made of synthetic rubber produced by this new process have undergone punishing road tests in Texas by the Firestone Test Fleet. Their performance indicates that the new cold process type synthetic rubber gives greatly increased mileage. It seems evident that the development of this new process can be a major factor in making synthetic rubber fully competitive with natural rubber in the mass production of passenger car tires."

Fiscal Year Operations

Speaking of the operation of the Firestone Company during the fiscal year just ended, Mr. Firestone pointed out a number of interesting highlights. "Our company has more than doubled its production of Foamex to keep pace with the increasing demands of the automobile industry for foamed rubber latex seat cushioning. The number of popular-priced cars which already have adopted foamex cushions indicates that demand for foamed rubber latex seating will continue to increase next year.

"Since our company-owned rubber plantations in Liberia, West Africa, are one of the largest sources of the high-quality rubber latex required for mattresses and cushioning, Firestone is in an advantageous position in the production of all types of high-quality foamed latex products."

Speaking of the part which the Firestone organization is playing in the new military preparedness program, Mr. Firestone said, "We have been devoting an increasing amount of time to the engineering of new, special-purpose equipment. In addition to improved tires and tubes for all types of vehicles and aircraft, we have further developed the 'Flying Runway,' the track-laying landing gear which makes it possible for large aircraft to land on soft terrain and makes them independent of paved landing fields. We have increased the production rate of bullet-sealing fuel cells and one branch of our Mechanical Rubber Goods Division is in continuous production on replacement tank tracks.

"A number of projects assigned to the Firestone Ordnance Division during World War II have been revived and production recently has been started on new-model, non-recoil 57 MM and 75 MM artillery rifles. These new guns were developed by the Ordnance Department to put the striking power of field artillery into the hands of the foot soldier."

De-Icer for Jet Bombers

A new aircraft de-icer capable of overcoming the severe icing conditions in the narrow air intake of a jet engine—one of the greatest problems in super-sonic flying—has been developed by the aeronautical division of the B. F. Goodrich Co. and is being installed as standard equipment on a new jet bomber. Utilizing electrically heated rubber, BFG engineers fabricated a special rubber lining for the jet's diffuser cowl, through which air flows to the combustion chamber. At high altitudes a jet engine's air intake frequently ices up, engineers pointed out, and sometimes chokes off the vital air supply. When that happens a jet engine will conk out. Rigid tests in cold laboratories and in the air are said to have demonstrated the efficiency of the equipment under the heaviest icing conditions.

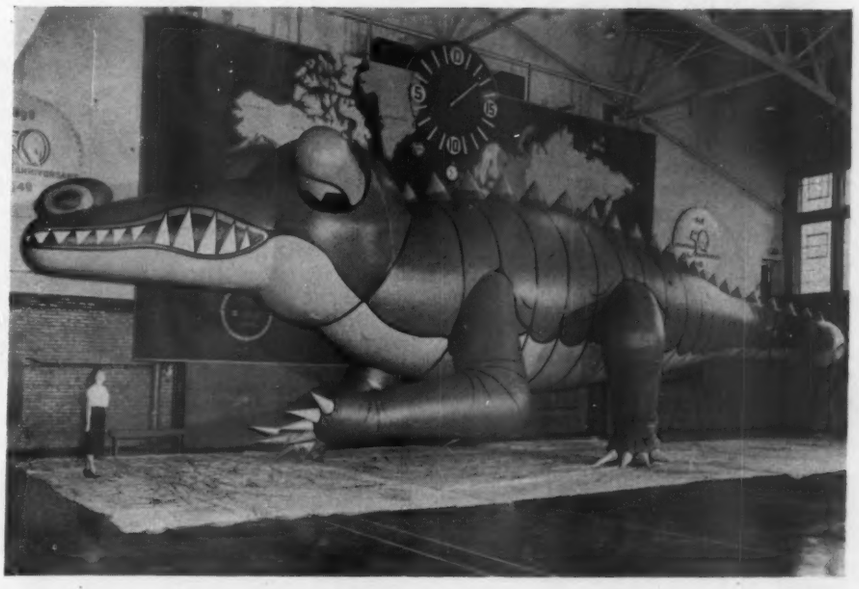
Matchless Pile Driver Hose

U. S. Rubber Co. has developed an oil resistant, high pressure steam hose for pile drivers used in building wharfs, bridges, railroad trestles and other heavy construction work. Marketed under the trade name "Matchless Pile Driver Hose," the product is especially designed to withstand the deteriorating effects of a combination of steam and hot oil which occurs when lubrication is applied to pile driving tools through steam pressure lines. The company states that its braided wire construction gives it unusually high bursting strength and acts as an armor to withstand heavy external abuse. The hose is constructed of a specially compounded rubber core, two or three piles of braided steel wire, one ply of asbestos cord, and a heat resistant rubber cover.

Akron Firms in Patent Suit

Two Akron firms—Ace Rubber Products Co. and the Allied Rubber and Plastics Co.—were named in a patent infringement suit filed in Federal Court at Cleveland, Ohio, on October 9 by Attorney Donald Gottwald, of Akron, and James C. Clark, of Findlay, Ohio. The suit charges that both companies are making and selling stair covers using a non-slipping feature on which the two petitioners were granted a patent last February. The suit calls for a temporary and permanent injunction and an accounting of royalties and damages.

MACY'S THANKSGIVING DAY PARADE FEATURES GOODYEAR CROCODILE



A huge crocodile measuring seventy-five feet in length and having a capacity of approximately 4500 cubic feet, manufactured by the Goodyear Tire & Rubber Co., was one of the featured figures in the annual Thanksgiving Day parade sponsored by R. H. Macy & Co., Inc., New York City. The crocodile, along with five other huge figures manufactured by Goodyear, required a force of 110 men to manipulate. Approximately 2,000,000 persons lined New York streets to view the procession of the crocodile followed by a huge gnome, a fireman, a candy cane, pirate and monkey on a trapeze, designed by Elizabeth Rogers of Goodyear's Art Department. Thirteen employees from the company's balloon room where the figures were made, accompanied them to New York and supervised the inflation and parading of the figures. The figures were all made of lightweight coated fabric.

NAMES IN THE NEWS

DR. DESIREE S. LE BEAU, director of research of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., has been elected Chairman of the Division of Colloid Chemistry of the American Chemical Society.

WILLIAM O'NEIL, president of the General Tire & Rubber Co., has been elected vice-chairman of the board of trustees of the National Council for Community Improvement.

DR. JAMES R. DONNALLEY, associated with the General Electric Co. since 1943, has been appointed manager of the company's silicone manufacturing plant at Waterford, N. Y.

WILLIAM S. MARTELL, associated with the Dayton Rubber Co. for the past 20 years, has resigned his position with that company to become manager of the automotive replacement department for the Goodyear Tire & Rubber Co.

NORMAN W. GILBERT has been appointed to head fractional horsepower and replacement V-belt sales for the Mechanical Goods Division of the Goodyear Tire & Rubber Co.

JAMES C. PLUNKETT, formerly associated with Duquesne Light Co., Pittsburgh, Penna., has been named assistant advertising manager for the Columbia Chemical Division of the Pittsburgh Plate Glass Co.

E. A. NORRIS, who served with the Acushnet Process Co. at one time, recently joined the Standard Products Co. at Port Clinton, Ohio, as factory manager.

BRADWAY S. PHILLIPS, formerly associated with the Seiberling Rubber Co., is now affiliated with the Bearfoot Sole Co. at Wadsworth, Ohio.

ROBERT W. STOKES, formerly eastern district manager of the Thermex Division of the Girdler Corp., has been appointed sales manager for W. T. LaRose & Associates, Inc., manufacturers of the Thermall electronic equipment at Troy, N. Y.

EDWARD M. FRICK, well-known in the upholstery field for his many years of service and achievement in the industry, has been appointed to a position in the sales department of the Pantasote Co., Passaic, N. J.

ANDERSON PACE, JR., formerly associated with the rayon department of E. I. du Pont de Nemours & Co., has joined the research staff of Bauer & Black at Chicago, Ill.

LEONARD MACLEAN, previously associated with the Keratol Co. and the Zapon-Keratol Division of the Atlas Powder Co., has joined Goodall Fabrics, Inc., as special sales promotion representative.

C. S. GORDON, wire development engineer of the Outside Plant Department of the Bell Telephone Laboratories, one of the oldest employees in point of service, has retired.

CARL H. POTTENGER, formerly assistant manager of the plastics department of the American Cyanamid Co., has joined the Chemical Division of Koppers Co., Inc., Pittsburgh, Penna., as an assistant sales manager.

V. A. WIBBELSMAN, associated with the U. S. Rubber Co. in various sales positions since 1920, has been appointed manager of clothing sales.

NORMAN RHOADES, head of the electrical department at the Akron plant of the American Hard Rubber Co. since 1935, has been named master mechanic at that plant.

FREDERICK L. BISSINGER, secretary of the Industrial Rayon Corp. since 1945, and head of its patent department since 1942, has been named vice-president in charge of research.

LEE R. JACKSON, president of the Firestone Tire & Rubber Co., was recently elected a vice-chairman of the Automotive Safety Foundation. He will represent the tire industry.

H. F. WAKEFIELD, of the Engineering Department of the Bakelite Corp., was recently elected chairman of the North Jersey Section of the American Chemical Society. FRANK R. MAYO, of the General Laboratories of the U. S. Rubber Co., was elected chairman-elect.

R. E. DAVIS, manager of sales research for the Goodyear Tire & Rubber Co., delivered the chapel address on the subject "Liberal Arts Training for Professional Salesmanship," during Vocational Guidance Day at DePauw University, Greencastle, Ind., on November 19.

W. H. PETERSON, associated with the Enjay Co., Inc., since 1943 as sales representative for the company's rubber and plastics products in the Midwest area, has been appointed manager of the company's office in Chicago, Ill.

HARVEY S. FIRESTONE, JR., chairman of the Firestone Tire & Rubber Co., has been awarded the Cross of Chevalier of the Legion of Honor by the French Government in recognition of outstanding service to agriculture throughout the world.

HARRY W. JULIAN, for the past three years merchandising manager of the Seiberling Rubber Co., has been promoted to assistant sales manager of the company.

Errett Named Works Manager

A. B. Errett, Jr.

A. B. Errett, Jr., formerly district manager of the Cleveland, Ohio, office of the H. O. Canfield Rubber Co., Bridgeport, Conn., has been appointed works manager of the company at Bridgeport. Before coming to H. O. Canfield, Mr. Errett served as a member of the board of directors of the New England Chapter of the Society of the Plastic Industry during 1946 and 1947. In 1946, he was also eastern sales manager of the Firestone Industrial Products Co. In 1945, Mr. Errett was product manager of the Molded Plastics Division of the Firestone Rubber and Latex Products Co. Mr. Errett has also been associated with the Armstrong Cork Co., as superintendent of its mechanical goods plant.

JOHN W. SNYDER, technical director of Binney & Smith Co., has returned from a three-week air trip to Europe, where he conducted a technical service survey of the rubber, paint and ink industries in England and France.

ROBERT N. WOLFE, formerly manager of the Minnesota Mining & Manufacturing Co. plant in Hutchinson, Minn., has been appointed manager of operations at the new company plant in Bristol, Penna.

V. C. LEATHERBY, sales engineering representative for different companies in the Pittsburgh, Penna., and the Cleveland, Ohio areas, has been named Pittsburgh district engineer for Industrial Ovens, Inc., of Cleveland.

RALPH K. GUINZBURG, president of the I. B. Kleinert Rubber Co., New York City, has been appointed chairman of the Rubber Division in the 1948 fund drive for the Travelers Aid Society of New York.

E. Q. BECKWITH, formerly president of the Beacon Petroleum Co., Tulsa, Okla., and previously associated with the Phillips Petroleum Co., Bartlesville, Okla., has been appointed manager of liquefied gas sales for the Sid Richardson Carbon Co., with headquarters in Fort Worth, Tex.

OIL FIRMS' TIRE SALES RISE FORMING COMPETITIVE FACTOR

Oil companies stand out as the most potent competitive factor in the tire business today, according to the latest in the series of periodic reports issued by Dr. Warren W. Leigh, head of the Commerce Department of the University of Akron. Oil firms sold one out of every four tires in the replacement market in 1947. Of the major distribution channels, the oil companies were the only ones to show a gain last year over 1946.

Independent dealers and distributors continue to sell the bulk of the replacement market. They lost ground slightly, however, dropping from 52.2% in 1946 to 51.7% last year. The survey, which presents a comprehensive picture of distribution at wholesale levels for the years from 1926 through 1947, excluding the war years of 1942-1945, states that out of 91,000,000 tires shipped by manufacturers last year, about 25,000,000 went to automobile manufacturers for original equipment. Some 3,000,000 were exported, and about 63,000,000 went to reshoe American cars and trucks.

It is the 63,000,000 replacement tires as well as replacement sales of other years with which the study is concerned. Dr. Leigh notes that oil firms did 23.7% of all the replacement business in 1947, as against 18.7% in 1946, an increase of 27%. They made 25% of the total passenger tire sales in 1947, as compared with 20.2% the year before. Truck tire sales in 1947 amounted to 16.8% of the market, up 60% over the year before.

Chain and mail order houses, pace setters in the tire business before the war, fell from 24% in 1941 to 17% in 1946 and 15.6% in 1947. Sales of manufacturers' stores declined in 1947 to the lowest percentage level since 1929. Their share of the replacement market tumbled from 9.6% in 1946 to 5.8% last year. It is to be noted, however, that wholesale sales of the more than 1,800 stores operated by Goodrich and Goodyear are not included in the report.

Number of Outlets Increases

The number of outlets selling tires increased from about 305,000 in 1939 to about 335,000 last year. In this group are an estimated 284,500 outlets affiliated with oil companies, ranging from company-owned stations to dealer stations and other types of businesses. Dr. Leigh states in his report that it is evident that the oil companies are beginning to take full advantage of their position in the tire market, and will become still a greater factor in the business of selling tires.

All of the big oil companies now have completely rounded merchandising programs with tires as an important link. Since the war, three of the firms, Gulf, Socony-Vacuum and American Oil, have come out with their own special brands instead of promoting brands of the various manufacturers. In this they joined such early leaders as Standard Oil and Cities Service.

These concerns with their thousands of outlets are in constant touch with the great majority of tire buyers, Dr. Leigh commented. Through their tire, battery and accessory programs, they are greatly improving their selling potentialities. Tire manufacturers and dealers shape their sales plans with an eye on the programs of these firms.

In compiling his report, Dr. Leigh had the confidential sales figures of 23 of the nation's tire manufacturers, all of the major retail organizations, 14 oil companies and numerous wholesale distributors and trade associations. These firms account for 95% of the total unit sales.

Pharis Tire Auction Sale

The plant, as well as the machinery and equipment of the Pharis Tire & Rubber Co., Newark, Ohio, will be offered at public auction on January 18, 19, and 20, 1949, at Newark. Three main buildings are to be offered, as well as typical rubber manufacturing and processing machinery, including mills, mixers, tubers, tire building machines, etc. Prospective purchasers of equipment are free to inspect the buildings, machinery and equipment from January 3 to the date of sale. Industrial Plants Corporation, 316 S. La Salle St., Chicago 4, Ill., has been designated agent for the auction. Interested parties may obtain illustrated descriptive auction circulars on request to the Industrial Plants Corp.

Latex Thickener 48 Available

The Advance Solvents & Chemical Corp., New York 16, N. Y., has announced the availability of Latex Thickener 48 which has been specifically developed for thickening latex. Among the advantages claimed by the company for the product are increased viscosity to prevent penetration, decreased sedimentation of compounding ingredients, greater thickness per coat in dipping operations, and better spreading characteristics. Latex Thickener 48 is not prone to fermentation in the wet stage, nor is it susceptible to mildewing in the latex films. The product is primarily recommended by the company for use with concentrated latex having solid content of 60%.

LOUISVILLE NEOPRENE PLANT SOLD TO DUPONT ORGANIZATION

The sale of the government-owned neoprene plant at Louisville, Kentucky, to E. I. du Pont de Nemours & Co., Inc., for $13,200,000, was announced by the Reconstruction Finance Corporation on December 6. Sale of the plant to DuPont had been pending for some time, presumably awaiting a decision from the Department of Justice, but no comment was forthcoming from that department when the sale was announced.

The Louisville plant was begun in 1941 by DuPont, was taken over by the government after Pearl Harbor, and was completed and operated by DuPont. It covers 214 acres, with 76 buildings comprising 818,000 square feet of floor space. Originally built for 10,000-ton annual capacity, it was stepped up in degrees in the 1942-44 period to its present 60,000-ton annual capacity. RFC's investment in the plant amounted to $37,740,000, but the plant has earned about $25,000,000 for the government agency, exclusive of depreciation.

Under the purchase agreement, DuPont, regardless of any difficulties involved, must maintain for national security a productive capacity in the plant of not less than 45,000 long tons of neoprene annually for at least five years. This obligation may be extended for an additional five years at the option of the government.

According to an announcement by the DuPont Rubber Chemicals Division on December 6, the present types of government neoprene, GR-M and GR-M-10, will be sold under DuPont's original designations, namely, Neoprene Types GN and GN-A, and they will continue to be supplied in the four plasticity grades—M-1, M-2, M-3, and M-4. The price of both types will remain at 32c a pound, f.o.b., Louisville. However, there will be no "uniform freight charge" and freight will not be prepaid or allowed.

Effective January 1, all orders for all types of neoprene should be mailed to the Rubber Chemicals Division. E. I. du Pont de Nemours & Co., Wilmington, Delaware. It will no longer be necessary to obtain purchase permits, and the company will accept customers' regular purchase orders or orders from brokers subject to its standard conditions.

In issuing its statement, the DuPont Rubber Chemicals Division requested that customers place their orders for neoprene with the company prior to the first of the month in which shipment is required, since such action will aid the company materially in planning production and maintaining an adequate stock.

Liquidating C. E. Miller Plant

The complete plant of the C. E. Miller Rubber Co. at Anderson, Indiana, is in process of liquidation. Machinery and equipment offered for sale includes mills, mixers, extruders, calenders, vulcanizers, hydraulic presses, pumps, stock cutters, compressors, etc. Full details regarding the equipment can be secured from the First Machinery Corp., 157 Hudson St., New York 13, N. Y., which is in charge of the liquidation proceedings.

PHILADELPHIA HEARS HURLEY ON SILICONE APPLICATIONS

J. S. Hurley of the Chemical Department of the General Electric Co., Pittsfield, Mass., addressed the December 3 meeting of the Philadelphia Rubber Group, held at Kugler's Restaurant, in Philadelphia, Penna. The subject of Mr. Hurley's address was "Silicones and Their Applications."

Mr. Hurley noted that the application of silicones in their many forms is ranching into practically every type of industry and also the consumer field. Silicone resins are being used as high temperature insulation, as bonding and impregnating materials, and in combination with woven glass cloth, asbestos and mica. Paints made with silicone resins have excellent chemical and heat resistance and are impervious to weathering. Silicone rubber combines many of the usual properties of natural rubber with chemical and heat resistance and low temperature flexibility far beyond the range of present materials.

The chemical and heat stability of silicone oils funnels these materials to applications in the hydraulic field where their small change in viscosity with temperature offers many advantages over existing products, said the speaker. Silicone oils are easily emulsified, and in this form find use in the rubber industry as mold release agents.

Other uses for these unusual fluids are as heat transfer fluids, dash pot fluids, anti-foam agents, anti-silking agents in the paint industry, water repellent treatments and many others. Also, a complete line of materials for a variety of applications has been developed which uses the characteritic water repellent properties of the silicones.

Producing Synthetic Alcohol

The first commercial production of a synthetic alcohol by a new process which provides a large low-cost source of raw material in plastics manufacturing has been announced by the Esso Standard Oil Co. The synthetic, iso-octyl alcohol, is used in the production of plasticizers. The process involves the reaction of a selected gasoline fraction with hydrogen and carbon monoxide gases in the presence of a special catalyst at pressure up to 3,000 pounds per square inch. Crude alcohol is recovered from the high-pressure operation and purified to yield finished iso-octyl alcohol.

Denman Tire Redeems Stock

The Denman Tire & Rubber Co., Warren, Ohio, has redeemed 6,032 shares of its 5% cumulative convertible preferred stock. The company, through its trustee, the Commercial National Bank & Trust Co. of New York, received tenders from 180 preferred stockholders. Prices paid were between $8.50 and $9.25 a share. This action reduces the number of preferred stock shares outstanding from 49,165 shares to 43,133 shares. Further tenders for the company's stock will be solicited on October 1, 1949.

Back Copies Wanted

Due to an unexpected demand for extra copies of our September, 1948, issue, our supply has been completely exhausted. Requests for this issue continue to reach us and accordingly we would appreciate the return of any copies which can be spared. We will pay 50c for each copy returned. Send both the copies and your request for payment to: Circulation Manager, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

WASHINGTON HEARS DOEDE SPEAK ON SILICONE RUBBER

The fifth regular meeting of the Washington Rubber Group, held in the Assembly Hall of the Cosmos Club, Washington, D. C., on November 23, was addressed by C. M. Doede of the Connecticut Hard Rubber Co., New Haven, Conn. The subject of Mr. Doede's address was the "Physical Characteristics of Silicone Rubber."

Mr. Doede stated that the silicone rubbers under discussion were made from a very pure dimethyl dichloryl siloxane by a hydraulsis and catalytic condensation to give a rubber which maintains its physical properties over a temperature range of —125° F. to +500° F.

Silicone rubber is unique among rubbers in that a single unplasticized composition will function over this wide range. The newer formulations have much improved resistance to permanent set, and at mildly elevated temperatures they are much better in this characteristic than any of the carbon base rubbers, said Mr. Doede.

The excellent electrical properties and the ease with which the material may be adhered to ferrous metals and to glass result in the use of the rubber where all types of mechanical applications for low temperature flexibility and heat resistance is desirable, concluded the speaker.

Cushionlok Rubber Backed Rug

Bigelow-Sanford Carpet Co., Inc., New York City, has introduced what is described as a revolutionary carpet known as "Cushionlok." The new product has a foam-rubber base, obviating underlays. William N. Freyer, vice-president for products of the company, said that to his knowledge this was the first time rubber had been interwoven with the fabric in a new patented process. The permanent resilience of the sponge rubber, he added, cannot be duplicated even by the most expensive type of felt underlay. Cushionlok is laid only in widths of twenty-seven inches, it is pretrimmed and no special tools are required for installation. The product was perfected after several years of research work at Bigelow's Thompsonville, N. Y., plant, where it is now in production.

The Johnson-Sperry Co., of Middlefield, Ohio, has been appointed distributor for the O-rings manufactured by the Parker Appliance Co., of Cleveland. Territory assigned is Southern Ohio.

ONTARIO GROUP HEARS WATSON SPEAK ON SYNTHETIC LATICES

The Ontario Rubber Section of the Chemical Institute of Canada held its annual out-of-town meeting at the Walper House, Kitchener, Ontario, in conjunction with the Wellington-Waterloo Section of the C.I.C. on December 8. W. H. Watson of the Polymer Corp., Sarnia, Ont., addressed the joint meeting on the subject, "Synthetic Latices, Their Production and Use."

Mr. Watson presented a short history of the use of latex and estimated the extent to which the use of latex has replaced the use of dry rubber. At the present time, said the speaker, about 5% of all rubber consumed is in latex form. The means of preserving and concentrating natural latex, and of preparing the various types of synthetic latices were outlined.

While natural rubber latex must be adapted in manufacturing practice to the particular use required, the greater versatility of synthetic latex is an advantage that users are quick to appreciate, said Mr. Watson. The improvements to synthetic latex types, as synthetic rubber research bears fruit, will still further expand the uses of the synthetic types.

Mimex Plant to be Auctioned

The Mimex Co., Brooklyn, N. Y., has ordered the liquidation of its chemical and paint manufacturing plant located at 12th Avenue and 37th Street, in Brooklyn, N. Y., at a public auction to be held on December 14 on the premises at 11:00 a.m. The plant comprises approximately 30,000 square feet, with 18,400 square feet on one floor. Machinery, equipment and inventory are to be offered and include such items as pebble mills, mixers, agitating and pressure tanks, pumps, compressors, etc. The auction will be conducted under the auspices of Fred Burger Co., Inc., 70 Wall St., New York 5, N. Y.

Add Three Arwax Concentrates

Three new types of Arwax concentrates for users of paraffin and microcrystalline waxes have been announced by the American Resinous Chemicals Corp., Peabody, Mass. The new products are concentrates of either polyethylene, butyl rubber or S-polymer in paraffin or microcrystalline wax and supplement the first series of Arwaxes which were Vistanex concentrates. All of the new concentrates are stabilized against degradation by heat and oxidation, and are expected to find use in laminations, food packaging, etc.

Discontinue Marbon B Production

Marbon Corp., Gary, Ind., has announced its discontinuance of Marbon B, a cyclized natural rubber resin. It had been announced in June, 1948, that inventories of Marbon B had been exhausted, and that the company expected to be out of production for several months to rebuild a manufacturing unit. This latest announcement removes the company as a supplier of cyclized natural rubber.

SCHLOSSER, BARTLETT, NEWMAN HEAD R. I. RUBBER CLUB IN '49

Harry L. Schlosser (Berlow & Schlosser) was elected chairman of the Rhode Island Rubber Club at the fall meeting of the group held on November 18 at the Crown Hotel in Providence, R. I. Other officers elected include: *Vice-Chairman,* Frederick S. Bartlett (U. S. Rubber); *Secretary-Treasurer,* Fred V. Newman (Respro). Francis W. Burger (Kleistone Rubber) and W. Kenneth Priestly (U. S. Rubber) were elected to the board of directors for a three-year period.

R. G. Volkman (U. S. Rubber) and C. Leigh Kingsford (Davol Rubber) are now members of the board for a two-year period, and William Potterton (Ernest Jacoby) and A. Donald Cummings (Collyer Insulated Wire) for a one-year period. The election of officers featured the meeting which was addressed by E. S. Miekle of the Westinghouse Electric Corp., who spoke on "Dielectric Heating in the Rubber Industry."

Mr. Miekle stated that RF heating has already proven itself in a limited number of industrial applications, and that a tremendous number of additional applications remain to be worked out. High pressure, multiple cavity molding, as an example, undoubtedly will offer one of the most lucrative fields in the rubber industry. The manufacturer, through the use of RF heating, realizes a better uniformity of product, a decrease in the percentage of rejects, better working conditions, and a lower over-all cost for his product.

The speaker stated that the solution of current problems requires the eolution of suitable production techniques and a real interest in studying the relationship of proper stock compounding to effectively use a new form of heating, i.e., radio frequencies. Each problem is peculiar to the specific type of product and must be handled as such.

The rubber industry, said Mr. Miekle, must make plans to further the development of RF heating itself, or be prepared to ultimately face competition from sources utilizing the latest scientific thinking for resultant better products at lower cost. While the manufacturer of RF heating equipment is ready to offer advice and assistance, it is the rubber manufacturer who must take the initiative in the application of RF heating to his own problems, concluded Mr. Miekle.

Aqualized Gums Available

Gum Tragacanth, Locust Bean (Carob) and Karaya can now be "dissolved" in a matter of minutes as a result of a new process developed by Glyco Products Co., Brooklyn, N. Y. Known as "Aqualized" Gums, the new Glyco products are said to represent a major improvement in the processing of vegetable gums. The new Aqualized Gums, now available in commercial quantities are said to eliminate the disadvantages of regularly processed gums in that they do not require the usual boiling, alkali treatments, or mixing with sugar, glycerine, glycols or alcohol. The gums find use in many industries for thickening, dispersing, emulsifying, stiffening and coating.

Coming Events

Dec. 28. Washington Rubber Group, Cosmos Club, Washington, D. C.
Jan. 10-14. Materials Handling Show, Convention Hall, Philadelphia, Penna.
Jan. 18. Buffalo Rubber Group, Westbrook Hotel, Buffalo, N. Y.
Feb. 4. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.
Feb. 18. Akron Rubber Group, Hotel Mayflower, Akron, Ohio.
Feb. 28-Mar. 4. A.S.T.M., Spring Meeting, Hotel Edgewater Beach, Chicago, Ill.
Mar. 21-23. N.A.W.M.D., Annual Meeting, Stevens Hotel, Chicago, Ill.
Mar. 25. Boston Rubber Group, Somerset Hotel, Boston, Mass.
Mar. 25. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.
Mar. 27-Apr. 1. American Chemical Society, 115th National Meeting, San Francisco, Calif.
Apr. 15. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.
May 20. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.
May 23-25. Rubber Division, A.C.S., Statler Hotel, Boston, Mass.
June 17. Akron Rubber Group, Outing
June 27-July 1. A.S.T.M., 52nd Annual Meeting, Chalfont-Haddon Hall, Atlantic City, N. J.
Sept. 18-23. American Chemical Society, 116th National Meeting, Atlantic City, N. J.
Oct. 10-14. A.S.T.M., West Coast Meeting, Fairmont Hotel, San Francisco, Calif.
Oct. 14. Boston Rubber Group, Somerset Hotel, Boston, Mass.
Dec. 16. Boston Rubber Group, Somerset Hotel, Boston, Mass.

Abrasives Makers Revise Pricing

A group of leading manufacturers of artificial abrasives agreed on November 16 to discontinue pricing practices the Government has challenged as illegal. The original complaint, filed last December, alleged that price lists were circulated privately among members of the Abrasive Grain Association. The manufacturers also have agreed to give future purchasers of artificial abrasives the option of buying at a delivered price, which will include the freight, or at a factory price based on the delivery price less cost of transportation. The agreement was made in a consent decree signed by Federal Judge John Knight in Buffalo, N. Y. Defendants in the suit in addition to the association were the Carborundum Co., Niagara Falls, N. Y., the Norton Co., Worcester, Mass., the Exolen Co., Tonawanda, N. Y., the General Abrasive Co., Niagara Falls, N. Y., and the American Abrasive Co., Westfield, Mass.

Washington to Hear Hauser

The December 28th meeting of the Washington Rubber Group, to be held in Washington, D. C., will be addressed by Professor E. A. Hauser of the Massachusetts Institute of Technology, who will speak on the "Structure and Composition of Elastic Colloids."

WADLEIGH AND TAYLOR ADDRESS NORTHERN CALIFORNIA MEETING

The November 18 meeting of the Northern California Rubber Group held at Angelo's Restaurant, Oakland, Calif., was addressed by Mrs. Willa T. Wadleigh, of the Naval Air Station, Alameda, Calif., who spoke on "Applications of Rubber in Naval Aircraft," and Rolla H. Taylor, of the Natural Rubber Research Station, Salinas, Calif., who addressed the group on "Microscopical Method for Determining the Profile of the Cut Edge of Died-Out Rubber Test Specimens."

Mrs. Wadleigh's talk dealt with the failures of various rubber items. Ozone cracking of airplane tires and protective coatings for tires were discussed. The failure of self-sealing gasoline tanks was described and the cause traced to changing from aromatic to alkylated gasoline. A plea was made by the speaker to cement manufacturers to better identify their products as to source and date of manufacture, and to include directions for application.

In his talk, Mr. Taylor stated that the cut edge of a died-out rubber test specimen is seldom plane and perpendicular to the face of the test sheet. In tensile testing, studies had been conducted to determine the mean cross sectional area of the specimen. In making tear tests, however, the actual profile of the cut edge becomes of greater importance. To study this profile required that undeformed sections of the rubber test specimens be obtained.

The frozen section technique in general use in biological applications was adapted to the rapid production of suitable material for study, said Mr. Taylor. The sections showed no evidence of deformation and were easily mounted and examined microscopically. Measurements of photo-micrographs of the section profiles showed considerable variation as to type and to degree.

Lewis Named Vice-President

Benjamin W. Lewis, associated with the Witco Chemical Co. for the past 22 years, has been appointed vice-president of the company in charge of western sales of the Manufactured Products Division. During Mr. Lewis' years of service with the company, he has been active in technical development and sales promotion. The list of manufactured products under his supervision includes metallic stearates, paint driers, Sunolite wax, rust preventatives, and other manufactured items. His headquarters will be in the Witco offices in the Tribune Tower, Chicago, Ill.

Dispose of Moldex Equipment

The rubber machinery and equipment of Johnson Moldex, Inc., 430 East Allegheny Ave., Philadelphia, Penna., was scheduled to be sold at auction on the premises on December 9. Among the equipment to be offered were mills, extruders, pan vulcanizers, presses, pumps, cutters, etc. The sale was in the hands of Samuel T. Freeman & Co., auctioneers of 1808 Chestnut St., Philadelphia 3, Penna.

FINANCIAL NEWS

United Carbon Company

Nine Months Ended September 30: Net profit of $2,284,773, which is equal to $2.87 a share, and which compares with $2,317,646, or $2.91 a share, earned in the first nine months of last year. Current assets as of September 30, 1948, totaled $12,730,615, and current liabilities amounted to $3,606,739. Current assets as of September 30, 1947, totaled $10,560,572, and current liabilities amounted to $3,184,233.

Columbian Carbon Company

Nine Months to September 30: Net income of $4,822,626, which is equal to $2.99 a share on sales of $31,394,497, and which compares with $4,680,587, or $2.90 a share on sales of $30,560,953 for the first nine months of 1947. Balance sheet items reveal current assets of $16,375,377, and current liabilities of $5,414,691. Current assets as of September 30, 1947, were $17,451,974, and current liabilities were $4,956,719.

New Jersey Zinc Co.

Nine Months Ended September 30: Net profit of $6,361,542, which is equal to $3.25 a share after all charges, compared with $6,213,848, or $3.17 a share for the same period last year. For the third quarter of the year the company reported a net profit of $2,185,447, which compares with $1,732,535 reported for the corresponding 1947 quarter.

Union Asbestos & Rubber Co.

Nine Months to September 30: Net income of $1,040,386, which is equal to $2.10 a share on net sales of $9,402,073, compared with $738,119, or $1.49 a share on net sales of $6,222,960 for the corresponding period of 1947.

Anaconda Wire & Cable Co.

Nine Months Ended September 30: Net income of $4,866,389, which is equal to $5.77 each on 843,962 capital shares, and compares with $6,492,996, or $7.69 each on 421,981 capital shares after adjustment for a two-for-one stock split in December, 1947, for the first nine months of 1947.

Minnesota Mining & Mfg. Co.

Nine Months Ended September 30: Net profit of $9,358,641, which is equal to $4.64 per share on sales of $79,841,184, and which compares with a net profit of $8,381,830, or $4.30 a share on net sales of $68,550,239 for the first nine months of 1947.

Pharis Tire & Rubber Co.

Seven Months to July 31: Net loss of $382,386 on net sales of $5,618,039. For 1947, the company showed a net income of $358,874, or 85 cents a share each on 424,000 common shares, on net sales of $19,280,272.

Raybestos-Manhattan, Inc.

Nine Months Ended September 30: Net profit of $1,480,350, which is equal to $2.36 each on 628,100 capital shares, against $1,502,914, or $2.39 each on 628,100 capital shares for the first nine months of 1947.

Thermoid Company

Nine Months to September 30: Net profit of $681,458, which is equal to 77 cents a common share, and compares with $610,974, or 77 cents a share for the corresponding period last year.

Columbia Chemical Appointments

Dr. Alphonse Pechukas, research director of the Columbia Chemical Division of the Pittsburgh Plate Glass Co., has announced the appointments of Dr. Albert E. Sidwell, Jr., as assistant director of research, and Ralph Wolf as manager of compounding research. Dr. Franklin Strain, who was appointed as assistant director of research earlier this year, will continue as administrative assistant to Dr. Pechukas. Dr. Sidwell, who was associated with the American Medical Association before joining Columbia Chemical, will direct the division's laboratory work in inorganic and analytical fields. Mr. Wolf was technical director of the Harwick Standard Chemical Co. before joining Columbia Chemical last January. He was previously associated with the Polson Rubber Co. and the Standard Oil Development Co., and also served with WPB during the war as chief of the synthetic rubber allocation section.

Use of Radioactive Standards

Detailed directions for use of radioactive standards and calibrated samples of radioisotopes issued by the National Bureau of Standards are given in a new 12-page pamphlet entitled *Measurement of Radioactive Isotopes,* now available as National Bureau of Standards Circular 473. In correlating measurements of radioisotopes in different laboratories, the Bureau distributed identical samples of radioactive materials to approximately 40 hospitals, universities, and similar institutions. The range of values reported by these laboratories varies as much as 80% from the average. These and other difficulties encountered are discussed in the booklet. Among the topics treated are basic principles of measurement, units, working standards, etc. Circular 473 can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 5 cents a copy.

CASING SHIPMENTS DECLINE AS PRODUCTION HOLDS STEADY

Manufacturers' shipments of passenger casings declined seasonally in September to 5,530,848 units from the August total of 6,575,964 casings, the Rubber Manufacturer's Association, Inc., reported recently in its regular monthly report. Truck and bus casings shipped during September totaled 1,169,488 units, against the 1,258,919 casings shipped in August. During September, a total of 6,700,336 casings were shipped, a drop of 14.48% from the 7,834,883 casings shipped in August.

Production of casings during September totaled 6,914,526 units as compared with the 6,962,556 units produced in August. Passenger car casings produced in September amounted to 5,740,418 units, and truck and bus casings produced totaled 1,174,108. In August, 5,768,614 passenger car casings were produced, and truck and bus casings produced totaled 1,193,942.

Inventories of automotive casings as of September 30, showed 9,805,223 units, compared with an inventory of 9,352,542 casings at the end of August. Passenger casings on hand at the end of September were 7,848,143 units; at the end of August, 7,462,765 units. Truck and bus casings on hand at the end of September were 1,957,080, as against 1,889,777 units at the end of August.

A total of 6,191,462 passenger and truck and bus tubes were produced during September, against the 6,638.552 tubes produced in August. A total of 6,200,044 tubes were shipped during September, while 6,917,140 tubes were shipped in August. Tubes on hand on September 30 totaled 8,778,449, while 8,527,448 tubes were on hand on August 31.

Report on Goodyear Earnings

According to the ninth of the series of "Notes on America's Rubber Industry" by P. W. Litchfield, chairman of the Goodyear Tire & Rubber Co., that company has sold approximately nine billion dollars worth of manufactured products during the past 50 years. Of the grand total, $4,000,000,000 was expended for materials (44.4%), $2,610,000,000 was paid out in wages and salaries (29%), $755,000,000 was the operational cost (8.3%), $720,000,000 went for taxes of all kinds (8%), $514,000,000 was retained for expansion and for plant and equipment replacements (5.7%), and $193,000,000 was paid out in the form of dividends to stockholders (2.1%). Goodyear is currently celebrating its golden anniversary.

New Colonial Insulator Plant

The Colonial Insulator Co., Akron, Ohio, has completed a large, new office and factory building which is adding 15,000 square feet to their present plant buildings on Grant St. in Akron. The Colonial company is said to rank with Akron's oldest, having been founded in 1894. It is one of the country's largest producers of electrical porcelain and is the only producer of porcelain rubber gloves of which electrical, surgeons', and household rubber gloves are made.

Celebrates 25th Anniversary

Russell S. Henderson

Russell S. Henderson, treasurer of the Weldon Roberts Rubber Co., Newark, N. J., celebrated his twenty-fifth year with the company on November 13. Throughout his years of service with the company, Mr. Henderson was closely associated with the late Weldon Roberts in the development of many new formulae and compounding processes for Weldon Roberts erasers. He played an important part in the company's research which pioneered the introduction of soft rubber abrasives into the metal industries, where the Weldon Roberts "Brightboy" products have proved valuable for finishing and polishing operations. Mr. Henderson is also identified with philanthropic activities, chief among which is his interest in behalf of the Essex General Hospital of East Orange, N. J. He is at present a trustee of the hospital and serves on the executive board.

Forming Indian Tire Factory

An Indian company has obtained the approval of the Government for the establishment of a tire factory at Trivandrum, Travancore State, South India. The factory is planned for an annual estimated production of 100,000 passenger car and truck tires, and certain other rubber products. It is to be capitalized at 20,000,000 rupees (approximately $6,000,000). The Travancore government is said to have 51% participation, and the remaining capital is to be supplied by private Indian interests. The new company is reported to be interested in arranging for technical assistance with a company in the United States on a royalty basis.

The use of Philblack A in mixtures of GR-S and whole tire reclaim for low cost tire treads is covered in a technical report recently prepared by the Rubber Chemicals Division of the Phillips Petroleum Co., Akron. Copies are available on request to the company.

"Cold Rubber" Timetable

The government-sponsored program on low temperature GR-S will begin to get into production by February, with most units due for completion in April, May and June, under the timetable planned by the Reconstruction Finance Corporation. When completed, the rated capacity of low temperature polymers will be 198,000 tons a year. Some installations are being held up by virtue of late deliveries of the necessary reconversion equipment, according to RFC officials, which makes it impossible to determine exactly when the various units will go into production. Since announcement of the original reconversion program, it has been decided to increase the capacity at the Port Neches, Texas, plant operated by the B. F. Goodrich Chemical Co. from the planned 15,000 to 30,000 tons per year. Low temperature GR-S is reported to be favorable for the manufacture of latex foam sponge rubber.

Status of Beebe Rubber Co.

In November, 1947, John Beebe, one of the founders of the Beebe Brothers Rubber Co. at Nashua, N. H., severed his connections with that company and the name was subsequently changed to the Beebe Rubber Co., with E. Colman Beebe remaining as president. William F. Newton, formerly associated with the Sponge Rubber Products Co., joined the new company as sales manager. Early in 1948 Walworth Johnson, formerly connected with the Firestone plant at Fall River, Mass., came with the company as superintendent. More recently, Richard P. Painter, previously chief chemist of the Norwalk Tire & Rubber Co., joined the company as production manager and chief chemist. Additional executive personnel includes Joseph Cullen as purchasing agent and Dana Sanders as assistant chemist.

LABOR NOTES

A contract between the Fremont Rubber Co. and the Fremont Labor Union (AFL) was ratified by the workers on November 7. It calls for a wage increase of 26 cents-an-hour. Fremont now employs over 350 persons

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An eighty-two day strike at the Natchez, Miss., plant of the Armstrong Tire & Rubber Co. was ended on November 6 when workers voted to accept a contract granting a general wage increase of 11 cents-an-hour for about eight job classifications.

A wildcat strike halted production of tires in Firestone's Plant 2 at Akron for six days last month, with workers returning to their jobs on November 22. The walkout was in protest over a change in the system of scheduling work.

U. S. Rubber laid off about 300 of its 3,400 employees at its Fisk Plant in Chicopee Falls, Mass., on December 3. The layoff was termed due to slack of business by company officials who also stated that it was "seasonal."

Visiting Malayan Plantations

Charles W. Bayley

In accordance with the recent appointment of the General Latex and Chemical Corp., Cambridge, Mass., as exclusive U. S. distributors of Harrisons & Crosfield, Ltd., Charles W. Bayley is currently in Malaya representing General Latex at the plantations of Harrisons & Crosfield. Mr. Bayley is establishing the latest American standards and methods of testing normal and centrifuged latex and is assisting in the development of new and better latices. Mr. Bayley has been associated with General Latex since 1941, except for a period of absence when he served during the war as a navigation and weather officer, U. S. Army Air Forces, in the South Pacific area. He is a graduate of Boston University, receiving his B.S. degree in chemistry in 1941. Mr. Bayley is expected to return to the U. S. by the first of the year.

Expands Naval Stores Plant

The Glidden Co., Cleveland, Ohio, has announced an expansion program for its Naval Stores Division plant at Valdosta, Ga., which will make it one of the largest pine gum producing plants in the world. When the program is completed, the Valdosta plant will be capable of producing more than 150,000 barrels of pine gum a year. Full-scale operations are scheduled to be resumed in March, 1949, since processing operations are to be halted for forty-five days during the winter in order to complete the expansion. Glidden will continue to be the sole producer of Nelio Resin. Recently, a rosin unit maintained by Glidden at Jacksonville, Fla., was destroyed by fire. Instead of rebuilding this plant, Glidden decided to concentrate its gum turpentine and rosin operations at Valdosta.

DeBell & Richardson, Inc., consulting engineers of Springfield, Mass., have moved their research and development laboratories into their own building in Hazardville, Conn.

TECHNICAL REPORTS AVAILABLE FROM DEPARTMENT OF COMMERCE

Data on additional reports on industrial and technical developments which occurred throughout the world during the wartime period are listed below. This information is taken from the "Bibliography of Scientific and Industrial Reports," issued by the U. S. Department of Commerce. Orders for reports, at the prices indicated, in *photostat* or *microfilm* type of reproduction, should be addressed to the Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D. C. Check or money order accompanying orders for microfilm of photostat reports should be made payable to the Librarian of Congress. Orders for reports available in *printed* form should be addressed to the Department of Comerce, Office of Technical Services, Washington 25, D. C. Check or money order accompanying orders for printed reports should be made payable to the Treasurer of the United States. Titles of the more recent reports follow:

Principles Relating to Design and Behavior of Rubber to Shock Absorption: Interrogation of Dr. Roelig. By A. E. Moulton. Dr. Roelig was in charge of the engineering physics department of the rubber services laboratory of I. G. Farbenindustrie at Leverkusen, Germany. The subject of the inquiry was a review of principles relating to the design and behavior of rubber springs for shock absorption and rubber suspension, where big deflections at moderate frequencies are experienced. Information obtained is presented in this report which includes a table, photograph, charts and graphs. Report No. PB-L-86144. 27 pp. Microfilm, $1.50; Photostat, $3.

The Synthesis of Acrylamides and the Copolymerization of acrylamides and Butadiene. These two pages on the production of acrylamides, and on copolymerization of butadiene with acrylamides, are translations of original reports, made in 1943, on work done by I. G. Farbenindustrie at Höechst, Report No. PB-L-80383. 14 pp. Mimeo, 50c.

Rubber Vulcanization Accelerators Produced by I. G. Farbenindustrie, A.G., Höechst, Elberfeld, Leverkusen. Process details which were obtained for the manufacture of 22 rubber vulcanization accelerators are reported upon in this document. These are designated by the trade name "Vulkacit" followed by appropriate designations specific to the individual compounds. Flow sheets appear in the text and diagrams of apparatus are attached. Report No. PB-L-78997. 91 pp. Mimeo, $2.50.

The Development of the New Styrene Catalyst. The development of a new styrene catalyst and the advantages obtained when used in the manufacture of styrene are covered in this report. The perfected catalysts Lu 82 and Lu 144 have been filed in a comprehensive patent application. A plant diagram has been attached to this report which was translated from the German. Report No. PB-L-80757. 13 pp. Mimeo, 50c.

Styrene Production in Germany. This report summarizes the results obtained at several German synthetic rubber plants based on field team reports so far available. Tables appear in the report, and flow sheets are appended. Report No. PB-L-80753. 22 pp. Microfilm, $1; Photostat, $2.

German Chlorinated Rubber. This report presents a fairly reliable assessment of the experience gained in the usage of chlorinated rubber paints in Germany. Much of the information obtained was dependent upon the memory of persons interrogated as many records had been destroyed or had been lost. Notes are included on the use of chlorinated rubber as a molding powder, as an adhesive, and in non-inflammable insulating compounds. Report No. PB-L-91681. 52 pp. Microfilm, $2.25; Photostat, $6.

Bonding of Rubber to Metal. By F. A. Jones and W. A. Gurney. This report is based upon an interview with Dr. Asbrand of the Harburger Gummiwaren Fabrik ("Phoenix") near Hamburg, and Deka Pneumatik, Berlin. The following points are covered: (1) type of rubber mixes used; (2) types of metal and treatment; (3) brass plating baths; (4) bonding with Desmodur R; (5) testing rubber-to-metal bonds; (6) vulcanization of rubber bonds; (7) mold design; and (8) other rubber-to-metal adhesives. Report No. PB-L-91703. 10 pp. Microfilm, $1; Photostat, $1.

Comparison of German By-Product Carbon Blacks From the Arc Process for Acetylene with Easy Processing Channel Black in a Natural Rubber Tread Stock. The results and experimental data are given for two samples of German by-product carbon black from the acetylene plant at Huels in the Ruhr, which were compared with an American EPC black (Kosmobile 77, United Carbon Co.). Tables are attached. Report No. PB-L-92504. 7 pp. Microfilm, $1; Photostat, $1.

Exchange of Experiences Between Schkopau and Hüls. In German. This report deals with improvements in design and operation of the furnaces and with recent changes in the processing (distillation) of the butadiene oils. Report No. PB-L-65466. 2 pp. Microfilm, $1; Photostat, $1.

Report on the Conference Dealing with the Present State of the Work in the Field of the Higher Acetylenes. In German. A study of work done at I. G. Farben, this document contains reports on the following subjects: (1) acetylene purification by low cooling and the substances resulting therefrom; (2) production of acetylene homologs from the low-cooling condensation product and transformations of the acetylene homologs; (3) hydrogenation of diacetylene and vinylacetylene to form butadiene; (4) reactions of di-acetylene with (a) formaldehyde, (b) alcohol, and (c) ketones. The description of the reactions is incomplete. The reactions are illustrated by diagrams. Report No. PB-L-65474. 18 pp. Microfilm, $1; Photostat, $2.

Experiments on the Continuous Production of Octenal from Butyraldehyde. In German. A process for the continuous production (in alkaline medium) of 2-ethylhexen-2al-1 (3-methylalheptane-3) from butyraldehyde is described in this report. The performance of the plant and the yield of octenal are specified. A diagram of the apparatus is included. Report No. PB-L-65476. 7 pp. Microfilm, $1; Photostat, $1.

"Marfanil," Hydrochloride of 4-Aminobenzyl Sulfonamide. In German. Complete details on the preparation of Marfanil with regard to large-scale production, and of the equipment used, are included in this document. Diagrams of the equipment are attached. Report No. PB-L-65479. 31 pp. Microfilm, $1; Photostat, $3.

Manufacture: The Use of Rubber for the Construction of Airplane Parts. In German. This is a bulletin consisting of reports given at Berlin on February 5, 1942, at a meeting of German researchers. Investigations pertained to the technical application of Buna and soft rubber as well as to research of rubber-to-metal parts under dynamic stress. Photographs, tables of data and charts are included. Report No. PB-A-60837. 27 pp. Microfilm, $1; Photostat, $2.

Use of Rubber Dies in Producing Laminations From Electrical Steel Sheets. By E. Marks. Thin stampings were made in Germany for supersonic apparatus by means of rubber dies and steel punches. Four targets were investigated in this report. The appendix contains a translation of patent specifications, drawings and photographs. Report No. PB-L-87910. 19 pp. Microfilm, $1.25; Photostat, $2.

Igatex: Synthetic Latex Supplement. This document is a translation of a German report prepared by I. G. Farben in May, 1943. The report deals with the following subjects: (1) Behavior of Igatex vulcanizates in cold; (2) dispersion agent consumption of several fillers and other solid latex addends; (3) emulsification of liquid auxiliary products for Igatex mixes; (4) thickening of Igatex mixes; and (5) heat sensitization of Igatex S, SS, and N with Igevin M50 ca. 50% in water. Several tables are included. Report No. PB-L-85767. 17 pp. Mimeo, 50c.

A four-flight conveyor belt has been permanently installed by the Blue Ridge Stone Corp. to transport crushed limestone from its quarry near Roanoke, Va., to its processing plant, three-quarters of a mile away. Installed by Goodyear, the system replaces six dinkey railroad engines.

The largest cylindrical tank ever lined in Akron with rubber by Goodrich was recently completed. The tank, with a capacity of 60,000 gallons, is 71 feet, 2½ inches long and 12 feet in diameter, and had to be moved on two flat cars.

A small stock of Silastic insulated lead cable is maintained at Midland, Mich., by the Dow Corning Corp. so that the company can fill orders for various sizes in various lengths. Large quantities are referred direct to several wire manufacturers.

FOR LONG LIFE IN BUS AND TRUCK TIRES AT LOWER COST

IN TREADS— STATEX-B provides abrasion resistance within 5% of EPC.

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COLUMBIAN CARBON CO.
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MPC (Medium Processing Channel)
STANDARD MICRONEX

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EPC (Easy Processing Channel)
MICRONEX W-6

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HMF (High Modulus Furnace)
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FF (Fine Furnace)
STATEX-B

◆

VFF (Very Fine Furnace)
STATEX-K

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FEF (Fast Extruding Furnace)
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SRF (Semi-Reinforcing Furnace)
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COLUMBIAN CARBON CO. — MANUFACTURER

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Offers New Compounds

American Anode, Inc., Akron, Ohio, is now marketing a new latex compound especially designed for applications requiring high heat resistance, and a new series of plastisols which are described as dispersions of resin and other compounding materials in a plasticizer containing no volatile organic liquids as diluent. These new products, called Anodex HR latex and Ameran resin paste, will complement the variety of latices, cements and suspensions now supplied by the company. Articles coated, dipped, sprayed or brushed with Anodex HR are said to possess the ability to withstand temperatures as high as 400° F., and the retention of tensile strengths up to 2,500 p.s.i., and elongations up to 1,000%. Potential applications for Anodex HR include heat resistant coatings for textiles and fabrics, such as radiator hose fabric, ironing board covers, insulating tapes and papers, etc. The new series of Ameran resin pastes makes available to processors plastisol compounds that are free from entrapped air. The new compounds may be used for coating metal and wire, plating racks, pipe lining, wood, textiles and paper; molding toys, industrial boots, and gaskets; or casting film and sheeting. They will be available in a wide variety of colors.

Raybestos Installs Press Belt

One of the largest precision hydraulic presses for making conveyor belts is now being installed in the Passaic, N. J., plant of the Manhattan Rubber Division of Raybestos-Manhattan, Inc. With a total cost estimated at close to $500,000 for this new unit, an addition to the factory was required to house the new equipment. The new press, which weighed 320 tons when assembled, will be used to fill a mounting backlog for V-belts, transmission belts and rubber hose items, company spokesmen stated.

Wilson Has Fiftieth Anniversary

B. Brittain Wilson, vice-president of the Bill Brothers Publishing Corp., and general manager of *India Rubber World*, has completed fifty years of service with the Bill Brothers organization. A cocktail party was held in his honor on December 1 at the Ambassador Hotel in New York City. Mr. Wilson was presented with several valuable gifts in recognition of his long tenure of service. A humorous skit tracing his life was a highlight of the occasion.

Warning on Latex Shipments

Latex Distributors, Inc., has issued a bulletin on the shipping and storing of rubber latex during freezing weather. Warning that responsibility lies with the purchaser and not with the seller or carrying agent, the bulletin discusses Railway Express, truck, railroad and parcel post shipments, outlining the difficulties encountered in each medium. Copies of the bulletin can be secured direct from Latex Distributors, Inc., 80 Broad St., New York 4, N. Y.

Gillespie Named Sales Manager

J. T. Gillespie, Jr.

J. T. Gillespie, Jr., associated with the Watson-Stillman Co., Roselle, N. J., since 1944 as director of export sales, has been appointed general sales manager of the company. Mr. Gillespie's business history, beginning immediately after his graduation from the Taft School and Yale University in 1926, includes three years import-export with China, Africa and India for L. C. Gillespie & Sons and three years investment brokerage with the firm of Smith, Barney & Co. For ten years prior to joining Watson-Stillman, Mr. Gillespie held sales and administrative positions with the Air Reduction Co., Inc., New York City, and with its subsidiary, Wilson Welder & Metals Co., where he was assistant to the president. For three years of the last war Mr. Gillespie was on loan from Air Reduction Co. to the government, first as Chief, Liaison Section, U. S. Maritime Commission, Division of Contract Distribution and later as Chief, Staff Branch of WPB's Shipbuilding Division. As part of his new position, Mr. Gillespie will continue to supervise the company's export sales. The previous sales staff of the company remains unchanged.

Materials Handling Conference

The broadest conference on the problems of materials handling in various industries ever to be conducted will be held at Convention Hall in Philadelphia from January 10 to 14, inclusive, under the sponsorship of the materials handling and management divisions of the American Society of Mechanical Engineers. The conference will be held concurrently with the Materials Handling Show. Sessions will be held on each of the five days and will feature opportunities for management, improvements in methods, case studies, panel discussions, advances in technique, and an equipment symposium. Copies of the full program can be secured from Clapp and Poliak, Inc., 350 Fifth Ave., New York 1, N. Y., managers of the exposition.

Polar Grip Winter Tire Tread

Polar Grip tire treads introduced by the Firestone Tire & Rubber Co. last year to make for safer winter driving, have been further improved and are now available to motorists. More than a million Icocel particles in the tread rubber provide the non-skid characteristics of the Polar Grip tread. This tread can be put on a motorist's present tires. Also, complete tires, with the new safety tread applied, may be obtained from Firestone dealers. The Icocel particles are milled and molded into the rubber. As these particles are exposed to the road, they act as an abrasive on wet and icy surfaces. When the Icocels wear away, the tread is left with tiny suction cups that grip the roadway at all times. The company offers two designs for motorists who change to Polar Grip treads. The De Luxe Champion, for city and suburban driving, and the Studded Ground grip, for cars driving on unimproved roads where snow and mud are heavy.

Offer Silvacon Extender

Silvacon is the name applied by the Weyerhaeuser Timber Co., of Longview, Washington, to a series of individual raw materials—cork, particles, lignified fibers, amorphous powder—separated from tree bark for industrial uses by special processes. These materials are reported to be finding use in a variety of products, especially as an extender in rubber compounds, thermosetting molding compounds and in magnesite flooring. As applied to rubber compounds, Silvacon is reported to make possible higher loadings, easier processing and faster dispersing. It is also said to have excellent low temperature flexibility. Abrasion resistance and increased impact strength are additional features offered by the new products. Technical bulletins are available from the company on request.

Beacofinish Wax Emulsion

The Beacon Co., Boston, Mass., has announced the production of a concentrated wax emulsion named "Beacofinish," which is said to be absolutely waterproof. The highly concentrated wax emulsion can be diluted with up to four parts of water. The product may be applied by dipping, sponging, spraying or brushing, and will dry in about 20 minutes or faster if force dried to provide a hard protective coating of great elasticity. Beacofinish may be ordered in neutral or black and in varying degrees of luster from brilliant to dull.

Enters Electronics Production

The Industrial Electronics Co., Hanover, Mass., has been formed for the production of photo-electric and electronic controls. Formed and headed by Clifton B. Andrews and Harold B. King, the new company will use a former war plant in Hanover for manufacturing facilities and offices. Both Mr. Andrews and Mr. King were formerly directors of the Ripley Co., Middletown, Conn. According to the officials of the new company, electronic controls show definite promise of wide usage in the rubber, plastics, and other industries.

LOS ANGELES NEWS

The November 9 meeting of the Los Angeles Rubber Group held at the Mayfair Hotel, Los Angeles, Calif., was addressed by T. E. Piper, Chief Materials and Process Engineer of Northrup Aircraft, Inc., who spoke on "Elastometer Applications in the Aircraft Industry." The meeting was sponsored by the Ohio Rubber Co. of California with General H. F. Safford, R. Dean Thomas and L. E. Budnick acting as hosts.

In his talk, Mr. Piper stated that foremost in aircraft engineering design is the proper selection of materials, their structural and functional form to be used in the fabrication of the airplane. This selection depends upon the weight-strength ratio for structural materials and physical characteristics adaptation of processing, procurement and methods of quality control for physical and functional materials.

A typical example of this is the use of elastometers for pressure sealing of all personnel compartments where at 50,000 feet above sea level the atmospheric pressure is 1.68 pounds per square inch as compared to 15 pounds per square inch at sea level. A failure of a seal in a pressurized cabin at this altitude would result in critical effects to personnel, the speaker emphasized.

Mr. Piper noted that the hydro press and drop hammer forming processes, so vital in the fabrication of airplane parts, rely entirely upon the use of elastometers to produce the intricate formed shapes in a cheap, economical manner, the absence of which would require expensive tooling beyond the economical scope of aircraft production requirements and inhibit the advances now taking place in aircraft production and design.

An evening program of entertainment was also presented and featured C. C. Rimmer, who talked on the subject of fighting traffic tickets. Mr. Rimmer's talk was well received by the audience. Table favors in the form of rubber ash trays molded into the shape of the State of Ohio were distributed to all members and guests attending the meeting.

Following Goodyear's three-day Golden Jubilee in Akron, 54 cities throughout the world where Goodyear has production and sales operations, joined in the celebration of the 50th anniversary. Los Angeles celebrated at the Ambassador Hotel, where on October 23, 500 members of supervision and executives of Goodyear's local tire plant, the sales organization, and the Goodyear Synthetic Rubber Corporation gathered for an annivesary banquet.

Vice-president Dent Sanford, who acted as master of ceremonies, greeted the group with a message from P. W. Litchfield, chairman of the board. Walter Vogt, chief chemist from Akron, and Paul Shoaff, manager of the Los Angeles tire plant, addressed the group, as did Frank Steele, superintendent of the Los Angeles tire plant.

Upon a recent visit to Los Angeles, Herbert E. Smith, president of the U. S. Rubber Co., said that he envisioned a great rubber industry for the west. The company's present installation in Los Angeles now produces 230,000 tires per month and has a monthly payroll of $650,000. Since 1941, Mr. Smith pointed out, the Los Angeles plant has doubled the number of its employees, its square feet of floor space and the tonnage of its finished products.

Mr. Smith predicted that the rubber industry will continue its present boom for at least two more years, and cited four factors as the basis for business optimism: full employment, Government spending for defense and ERP, continuation of shortages, and Government purchases.

Mr. Smith spoke also of the new "cold rubber" and the effect that this development was having on the industry. Of the industry's total synthetic rubber operating capacity, 183,000 tons, or one half, will be devoted to the production of "cold rubber." He stated that as soon as this new material could be delivered to the West Coast, U. S. Rubber will undertake to build tires of this material at the Los Angeles plant.

Robert W. Carr, of the Technical Products Division of the Shell Oil Co., has been transferred from the Los Angeles area to San Francisco. Mr. Carr was succeeded by Charles Finley, recently arrived from San Francisco.

A. D. Broido, formerly of the Electric Wire and Reclaimed Rubber Companies of Palestine, has established residence in Southern California.

Bob Wade of Oliver Processing has recovered from an illness and is back at work after a brief sojourn in the hospital.

William C. Frendling, formerly associated with the Muth Rubber Co., has announced the establishment of the Wefco Rubber Manufacturing Co., 1655 Euclid Street, Santa Monica, Calif., with offices in Los Angeles at 2055 East 38th Street. Merchandise line will be small rubber molded parts and mandrel stocks, specializing in rubber-to-metal bonded parts.

Pictured left to right above are General H. F. Safford of the Ohio Rubber Co., Phil Drew, chairman of the Los Angeles Rubber Group, and R. D. Thomas of the Ohio Rubber Co., at the November 9 meeting of the group.

Symposium on Industrial Fabrics

A Symposium on Industrial Fabrics will feature the Winter Meeting of the Akron Rubber Group, to be held on February 18 at the Mayflower Hotel in Akron, Ohio. One of the principal speakers will be Dr. Warren F. Busse, formerly director of physical research for the B. F. Goodrich Co. and now director of the Institute of Textile Technology at Charlottesville, Va. K. D. Smith, of the National-Standard Co., will serve on the discussion panel as the expert on wire fabrics. Companies which have agreed to supply personnel for the panel discussion include American Viscose and Industrial Rayon, rayon fabrics; DuPont, rayon and nylon; Wellington Sears, cotton; and Owens-Corning Fiberglas Corp., glass fabrics. The technical session will begin at 4:00 p.m., and will be followed by dinner and an evening talk by L. F. Livingstone, manager of public relations for DuPont.

Goodall Retires From Mohawk

P. H. "Pete" Goodall, assistant to the president of the Mohawk Rubber Co., Akron, Ohio, and a veteran of 44 years in the tire industry, retired recently. Mr. Goodall began his business career in 1904 with the Hartford Rubber Works Co. which later was taken over by U. S. Rubber. He was a district manager for U. S. Rubber when he left to join Mohawk. In 1944, Mr. Goodall was named assistant to President R. E. Bloch. An ardent baseball fan, Mr. Goodall was presented with a television set by Mohawk directors just before the recent world series. He also was tendered a dinner by his associates at Mohawk. Mr .and Mrs. Goodall plan to spend their winters in Florida.

Perma-Flex Cold Mold Compound

The Perma-Flex Mold Co., Columbus, Ohio, has developed a new cold pouring, cold curing synthetic rubber compound known as Perma-Flex Cold Molding Compound. The cold molding synthetic is flexible, and is adapted to forming molds directly over modeling clay, wax, soap, wood, and other heat sensitive materials. The material is not affected by water, mineral oil and most solvents when cured, and is said to withstand heats up to 300° F. for short periods without distortion or softening. The material consists of Liquid "A", brown Curative "B," and yellow Curative "C", which must be mixed together in definite proportions at the time of use. The company states that the product is an excellent material for making masks to withstand lacquers containing strong solvent materials. The material does not swell and distort in the presence of most lacquers and finishes.

"Heel Bar" Is Innovation

The latest innovation in the field of merchandising is the "Heel Bar," developed by the Auto-Soler Co. of Atlanta, Georgia. It consists of a semi-circular counter with four chrome bar chairs, with an opening in front of each chair. An attendant reaches through the opening and removes the shoes from the feet of the customer sitting on the chair. Three minutes later the shoes are returned heeled. The application of the heels is performed by a machine that manufactures its own nails from a coil of steel wire and drives them at the rate of three per second. The nails are countersunk in the heels so that they are not visible.

New Process for Rayon Pulp

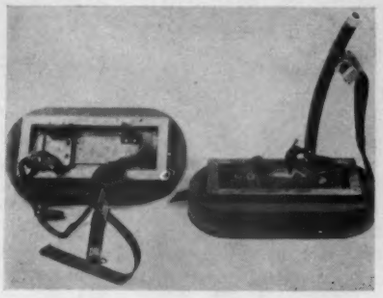
The International Paper Co. has announced that a rayon pulp mill designed to employ a new process for dissolving wood pulp used in the manufacture of rayon and other synthetic products will be built in the South. For the first time in the production of rayon pulps, hard woods instead of soft woods can be used and the procedure is based on the sulfate rather than the sulfite process. Pulp produced by the new process was said to be particularly adapted for the production of rayon specialties such as high tenacity yarn for tires and mechanical rubber goods among other products.

Offer Annotated Bibliography

An annotated bibliography of the literature on Compound G-4 and Compound G-11, which have found widespread acceptance as fungicides, antiseptics and germicides, has been published as the Autumn, 1948, issue of the *Sindar Reporter,* house organ of the Sindar Corporation, 330 West 42nd St., New York 18, N. Y. The bibliography contains references and abstracts of almost 100 scientific and trade articles and patents. Copies are available on request to the company.

Antipersonnel Mine Footpads

A footpad which increases the foot soldier's chances of crossing an area strewn with diabolically concealed antipersonnel devices, like the German Schu and "S" mines, by more than 95 percent has been designed by the Engineer Research and Development Laboratories at



Fort Belvoir, Va. Called the Shoe, Protective, Antipersonnel Mine, M1, it consists of an aluminum alloy plate, elliptical in shape, 20 x 10 inches, affording about 180 square inches of ground contact. Fourteen one-inch holes in this plate allow air free passage through a short rubber hose to and from the cushions and allows "breathing" even in fairly deep water or heavy rain without absorption of moisture. The foot is secured to the upper surface with a cotton duck webbing harness. The two top cushions are formed of foamed neoprene enclosed in a waterproof cover, which is cemented to the aluminum plate. The bottom cushion of latex foam is cemented to the underside of the top cushions. Despite their awkward appearance. the footpads weigh only six pounds each, and are said to be neither too uncomfortable or fatiguing.

Enters Plasticizer Field

The manufacture of plasticizers for vinyl and other synthetic resins has been announced by the B. F. Goodrich Chemical Co., Cleveland, Ohio. Production facilities are now under construction as a part of the $3,000,000 expansion at Avon Lake, Ohio, announced earlier this year, with initial large-scale operations scheduled for the second quarter of 1949. Trial quantities of the new plasticizers are currently available from the experimental station pilot plant at Avon Lake.

A technical service bulletin is available from the Thiokol Corp., Trenton, N. J., on the use of Plasticizer TP-95 in nitrile rubber and synthetic resins. Copies are available from the company on request.

The large transport planes used by the U. S. Air Forces to bring food and other vital supplies into Germany are being equipped with de-icers to assure continued operation during winter conditions. The de-icers are made by Goodrich.

Pittsburgh Plate Glass Co. has acquired controlling stock interest in the Midvale Coal Co. The company is being liquidated and the Columbia Coal Division will operate the mine, which is located near New Philadelphia, Ohio.

Officers of Colonial Rubber

The Colonial Rubber Works, Logansport, Indiana, which was organized in 1946, originated as a partnership with W. K. Wickersham and D. L. Hotaling under the name of Mid-States Rubber Co. At the time of incorporation, Mr. Wickersham was elected president and general manager, a position he holds today, while Mr. Hotaling was elected vice-president and general sales manager. W. B. Bannon is factory superintendent of the company, and V. K. Goodpaster is office and personnel manager. Purchasing agent for the company is J. K. Tracy. The company produces sponge rubber in molded and sheet form along with die cutting sponge rubber sheet. The company also manufactures molded and extruded dense rubber products from both natural and synthetic rubber. Sales offices are maintained in Chicago, Cincinnati, Detroit, and Indianapolis.

Koppers to Supply New Agitator

The Engineering & Construction Division of Koppers Co., Inc., Pittsburgh, Penna., has signed an agreement with Dr. Bronislaw Goldman, Pittsburgh consulting engineer, whereby it will be able to furnish the Goldman agitator for chemical or other industrial plant installations. The Goldman agitator, recently patented in the United States, is said to work on an entirely new principle which is so efficient that the mixing or washing time of chemicals is materially reduced. The agitator is so constructed that it propels liquid to the sides of the tank and upward. At the top, the liquid is drawn to the center where it is pulled downward through the hollow axis upon which the agitating blades are fastened. It is expelled from the bottom of this hollow axis to repeat the process.

Britain Takes Rubber Loss

Great Britain took a loss of some $3,000,000 in the recent sale of stockpile rubber to the United States Government under the European Recovery Program, according to Harold Wilson, president of the British Board of Trade. The value of the rubber turned over to the United States from the British stockpile was $18,000,000. Mr. Wilson explained the loss by stating that the rubber was originally purchased by Britain at "a very high price" under a wartime agreement with Ceylon.

Linde Enters Silicone Field

Linde Air Products Co., subsidiary of Union Carbide & Carbon Co., has entered the silicon chemicals field with the production of four new products known as "silanes." Linde is now selling experimental amounts of four types of "silanes" at prices ranging from three dollars to three and one-half dollars a pound. It is expected that prices will be reduced when larger plant facilities now being built are in production. The largest producers of silicones are Dow-Corning Corp., and the General Electric Co.

CANADIAN NEWS

According to a report issued by the Canadian General Manufacturing Statistics Department, the number of establishments manufacturing rubber tires, rubber footwear and other rubber goods in 1946 totaled 60. At that time thirty-two plants were located in Ontario, twenty in Quebec, two in Manitoba, two in Saskatchewan, and three in British Columbia. These plants furnished employment to 22,055 persons and produced goods valued at approximately $160,000,000 from materials costing approximately $62,000,000.

The plants in Ontario employed almost 72% of the persons engaged in industry and produced over 82% of the entire output. Over 27% of total employment and almost 18% of production was in the province of Quebec. Besides supplying the domestic market, the industry contributes materially to the export trade of Canada.

A notable feature in 1945 and 1946 was the increase in the output of balloon tires for passenger cars, which rose from 855,224 covers in 1944 to 1,303,151 in 1945 and to 1,894,893 in 1946. Other features were the resumption of large-scale exports of rubber footwear and the increasing use of natural rubber.

Of the three main classes of products manufactured in 1946, rubber tires and tubes accounted for approximately $72,000,000, or over 46% of the total, rubber for approximately $33,000,000, or almost 17%, and other goods for the balance of approximately $60,000,000, or over 37%.

Kayson Rubber & Plastics Ltd., 144 Water St. S., Galt, Ontario, has been formed for special work in rubber and plastics compounding. S. Kauffman is president of the new company which began production on October 15. Mr. Kauffman was formerly associated with Canadian General Tower, Ltd., in Galt for the past six years as chief chemist. The new company is presently engaged in reclaiming and specially coloring polystyrene, methyl methacrylate, cellulose acetate, etc. The plant has 20,000 square feet of floor space and has a capacity of 10,000 pounds of recolored styrene per day. The plant is said to be the only one of its type in Canada where molders can send material to be reclaimed, or for special coloring tasks.

The annual "Service Pin Dinner" of the Goodyear Tire & Rubber Co. of Canada was held in Toronto recently, with P. W. Litchfield, chairman of the board of the parent company, as the special guest. Among those receiving pins in recognition of 40 years of service with the company were C. H. Carlisle, E. H. Koken, L. P. Barrett and E. C. McConnell. The company now has 410 members of the 25-year-or-more class. In an interview, Mr. Litchfield stated that a stockpile of rubber for defense purposes could be build up in Canada without intereference with the flow of tires and other rubber goods to the consumer. He pointed to the successful stockpiling being achieved in the United States.

Two factories of the Dominion Rubber Co., Ltd., were recently awarded trophies by the Department of Labor for outstanding safety records. The St. Jerome Footwear plant received a trophy for operating twelve consecutive months without a lost time accident, thereby establishing a frequency rating of zero, while the Montreal Mechanical Goods Plant secured an honorable mention certificate for operating one million man hours without a lost time accident for two separate periods, from April 11 to November 13, 1947, and from December 1, 1947, to August 18, 1948. The St. Jerome Plant also received the "Excellence Shield," the highest honor given by the Quebec Association for the Prevention of Industrial Accidents. P. E. Dery, supervisor of safety for Dominion Rubber, was also awarded a special certificate by the Association for his outstanding work in the field of accident prevention.

R. A. Patterson has been appointed manager of accessory and bicycle tire sales for the tire division of the Dominion Rubber Co., Ltd., in Kitchener. Prior to his appointment, he was assistant to the general sales manager in the Kitchener tire plant. J. Don Ferguson has been named assistant manager, manufacturers' sales, in the tire division. He joined the company in 1946, and has been associated with the export division, farm and tire sales, and the tire engineering departments.

E. G. Wellheiser, formerly district manager, Eastern Division Footwear, B. F. Goodrich Rubber Co., Ltd., Kitchener, Ont., was recently appointed general sales manager of the British Rubber Company of Canada, which has its general offices in Montreal and factory at Lachine.

R. C. Berkinshaw, general manager of Canadian Goodyear, said recently that because of "substantial capital expenditures" his company would not pay any more than the $3.50 in dividends which have been declared so far this year. The company declared a 50-cent dividend recently.

New Goodyear Appointments

H. R. Thies, manager of the Chemical Division of the Goodyear Tire & Rubber Co., has announced the appointments of R. T. Hickox as West Coast manager for the division with headquarters in Los Angeles and C. O. McNeer as district manager at Chicago. Both men were formerly with the company's Plastics and Coatings Department, from which the Chemical Division was formed.

S. Kauffman

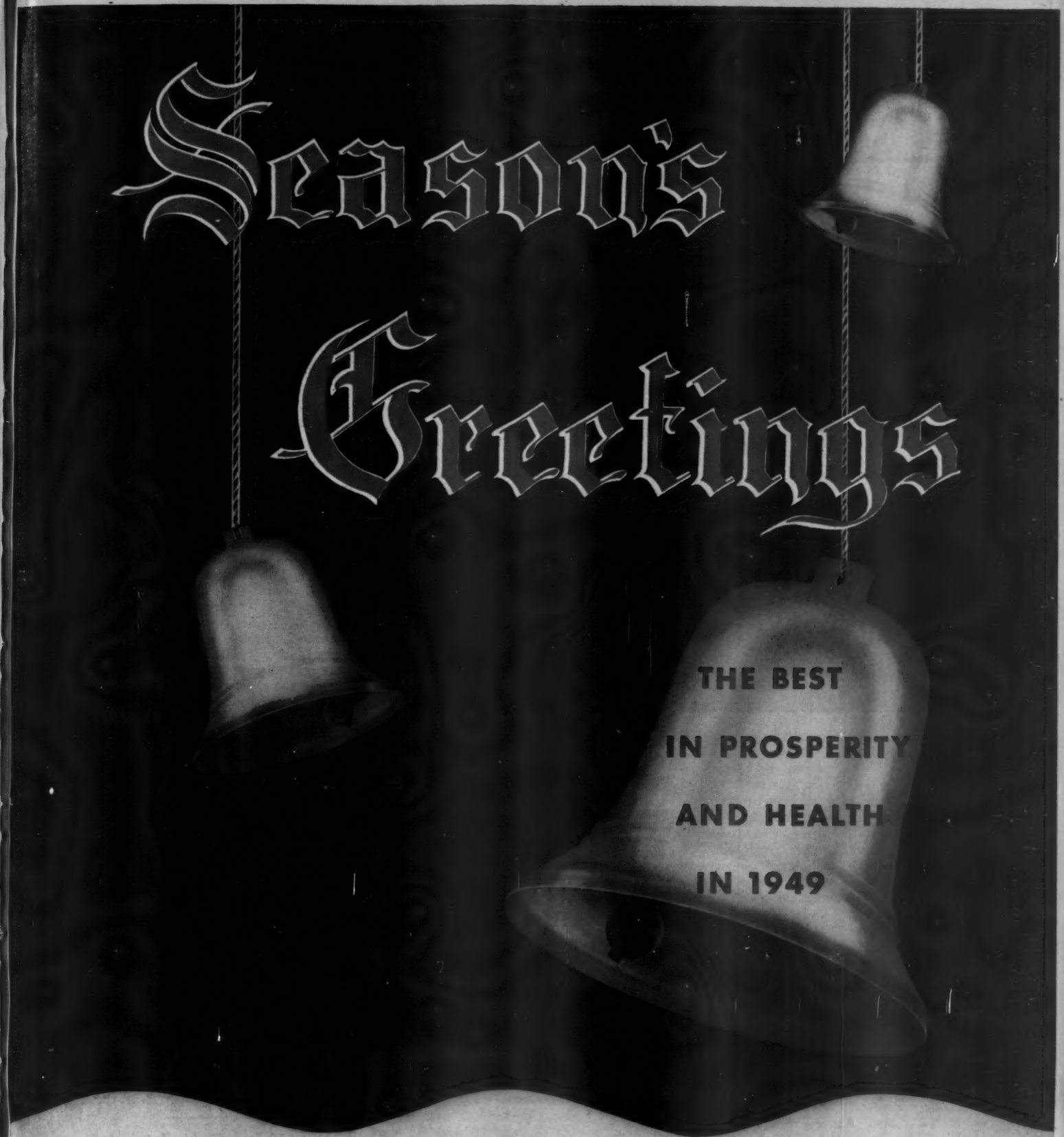
Heads New Kayson Rubber Co.

Rubber Safety Section Officers

T. H. Boyd, of the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., was elected general chairman of the Rubber Section of the National Safety Council for the 1948-49 period at the recent National Safety Congress held in Chicago. H. L. Andrews, of the Firestone Tire & Rubber Co., Akron, was elected vice-chairman in charge of program, and S. A. Wright, of the Inland Manufacturing Division of General Motors Corp., Dayton, Ohio, secretary. R. M. Boyles, of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., was named News Letter Editor. The following committee chairmen were also named: *Engineering,* R. W. Fickes (Goodyear, Akron); *Trade Association,* M. E. Badstuber (Ohio Rubber); *Health,* F. W. Sands (U. S. Rubber, New York); *Membership,* G. E. Trank (Hewitt Rubber); *Publicity,* George Burkhardt (General Tire); *Poster,* C. E. Beck (St. Clair Rubber); *Statistics,* J. L. Dean (Firestone, Memphis).

Ceylon Negotiations Continue

According to reports from Colombo, the recent Russian offer to purchase the bulk of Ceylon's output of natural rubber will not reach the stage of practical bargaining. In some circles it is anticipated that an announcement will soon be forthcoming covering either a United Kingdom-Ceylon or a United States-Ceylon agreement. It is expected that any such agreement will cover the purchase of rubber at a price higher than that in effect during the war period and will extend for a considerably longer period of time than that offered by the Russians. Added strength is given to these reports by the recent decision of the Ceylon Cabinet to defer action on the Russian proposal.



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OBITUARIES

Vere H. Dingmon

Vere Henry Dingmon, who retired two years ago after serving for many years as president of the Xylos Rubber Co., Akron, Ohio, died on November 20 in Peoples Hospital in Akron, after a long illness. He was 57 years old. Born in Portland, Ore., Mr. Dingmon attended the Ferris Insti-

tute, Big Rapids, Mich., graduating in 1909 after majoring in a business administration course. The same year he became accountant for Fairbanks, Morse & Co., at Chicago, Ill. In 1914 he joined the Detroit Electric Car Co., Detroit, Mich., as auditor, and in 1919 became associated with the Warren-Lamb Lumber Co., Rapid City, S. D., as auditor and logging supervisor. Mr. Dingmon entered the rubber industry in 1925 when he joined the auditing staff of the Firestone Tire & Rubber Co. In 1927, he was appointed vice-president and general manager of the Xylos Rubber Co., a Firestone subsidiary. Later, Mr. Dingmon was elected president of the company, a position he held until his retirement two years ago. In 1943 he was appointed a member of the war production board and became deputy administrator in charge of the scrap and reclaim division. From 1936 to 1938 he was president of the Rubber Reclaimers Association. Funeral services were held on November 23 at the Billow chapel, Akron, with interment in Rose Hill Burial Park. His wife survives.

Ray M. Laird

Ray M. Laird, consultant engineer for the Goodyear Tire & Rubber Co., died in Robinson Memorial Hospital, Ravenna, Ohio, on November 24. He was 54 years old. A native of Huntington, Penna., Mr. Laird had been associated with Goodyear for the past 24 years. Services were held on September 27 in the Wood Funeral Home in Ravenna with interment in Homeland cemetery, Rootstown, Ohio. His wife survives.

Paul C. Jones

Paul C. Jones, director of the Dominion Rubber Co., Ltd., Montreal, Quebec, Canada, a subsidiary of U. S. Rubber, died on November 27 at his home in Richmond, Va. Born in Franklin City, Va., Mr. Jones went to Canada in 1936 after several years' service with industries in Cuba and Chile. He was chairman of the board of Terminal Warehouses, Ltd., Toronto, from 1936 to 1939. He served as a director of Dominion from October, 1939, until his death. From October, 1939, to January, 1946, he was president of the company and from 1946 until April, 1948, he was vice-chairman of its board of directors. He had also been vice president of Irwin Dyestuffs Corp., Montreal, director of the Baymond Corp. in Toronto and a director of the Rubber Association of Canada. Since his retirement as president of Dominion, Mr. Jones had lived in Richmond. His wife and two sons survive.

George F. Johnson

George F. Johnson, founder of the Endicott Johnson Corp., Endicott, N. Y., died on November 29 at his home in Endicott at the age of 91. Mr. Johnson rose from a shoemaker's work bench to become the head of the largest shoe factory in the world. Born in Milford, Mass., on October 15, 1857, Mr. Johnson became a shoemaker's apprentice at the age of 13. He took charge of the Lester Brothers' shoe factory in Binghamton, N. Y., in 1897, when that firm was in financial difficulties. With the assistance of Henry B. Endicott, largest creditor of Lester Brothers, Mr. Johnson instituted a series of labor reforms and technological changes that resulted in the company as it exists today. Two sons, George W. Johnson, president of the company, and Walter L. Johnson, and two daughters survive.

La Motte Van Riper

La Motte Van Riper, one-time vice-president and sales manager of the former Ajax Rubber Co., died in Knickerbocker Hospital in New York City on December 3 after a brief illness. He was 70 years of age. At the time of his death, Mr. Van Riper was a vice-president of McKesson & Robbins. At one stage in his career, he was branch manager of the Chicago district for the U. S. Rubber Co. Born in Flat Rock, Mich., Mr. Van Riper was educated in the Detroit schools. After spending about twelve years in the rubber industry he transferred his activities to the drug field, becoming associated with McKesson & Robbins in 1929. He remained with that firm in various executive capacities until his death. A widow survives.

Frederick G. Cottrell

Dr. Frederick G. Cottrell, scientist and inventor, died in Berkeley, Calif., on November 16 while attending a business meeting of the National Academy of Sciences. He was 71 years old. Born in Oakland, Calif., Dr. Cottrell received a B.S. degree from the University of California in 1896. He also studied at the University of Berlin, and received a Ph.D. from the University of Leipzig in 1902. The University of California bestowed an honorary L.L.D. upon him in 1927. While on the campus of the University of California in 1906-09, Dr. Cottrell perfected the Cottrell electrical precipitator. Funds from the sale of the precipitator helped develop the X-ray microscope, the military rocket and other devices. Funds from its sale were also applied to the formation of the Research Corporation, an institution devoted to the advance of scientific development both through research and monetary grants. Dr. Cottrell was formerly a technical consultant to the Smithsonian Institute.

Hugo Harding

Dr. Hugo Harding, a research chemist specializing in rubber substitutes formerly associated with the old Ajax Rubber Co., and the B. F. Goodrich Co., died on November 26 at his home in Orange, N. J. He was 79 years old. Born in Germany, Dr. Harding studied with Wilhelm K. Roentgen, discoverer of the X-ray. He received the degree of Doctor of Philosophy from the University of Wurzburg and later studied at the University of Zurich. He came to this country in 1908, returned to Germany briefly, but established permanent residence and became a U. S. citizen in 1913. During the first World War Dr. Harding developed a formula for the production of "synthetic rubber" which was produced by Ajax Rubber.

Merrill E. Hansen

Merrill E. Hansen, chief engineer of the American Anode Co., Akron, Ohio, died on November 23 in Akron City hospital, where he had been a patient for a month. Mr. Hansen was born in Beloit, Wis., 51 years ago. A veteran of World War I, he belonged to the Silver Lake American Legion Post. He was also a member of the American Institute of Chemical Engineers. Services were conducted on November 27 in St. John's Lutheran church, Cuyahoga Falls, Ohio, with burial in Crown Hill cemetery, Cuyahoga Falls.

Walter P. Hallstein

Walter P. Hallstein, assistant manager of the belting sales department of the Goodyear Tire & Rubber Co., died recently as a result of injuries sustained in a traffic accident in Akron. He was 40 years old. Mr. Hallstein came to Goodyear in 1933, two years after his graduation from Purdue University. He became assistant manager of the division in 1943. Rites were held on November 1, at Christ Episcopal Church, Hudson, Ohio, after which the body was taken to Cleveland for cremation. His wife and two children survive.

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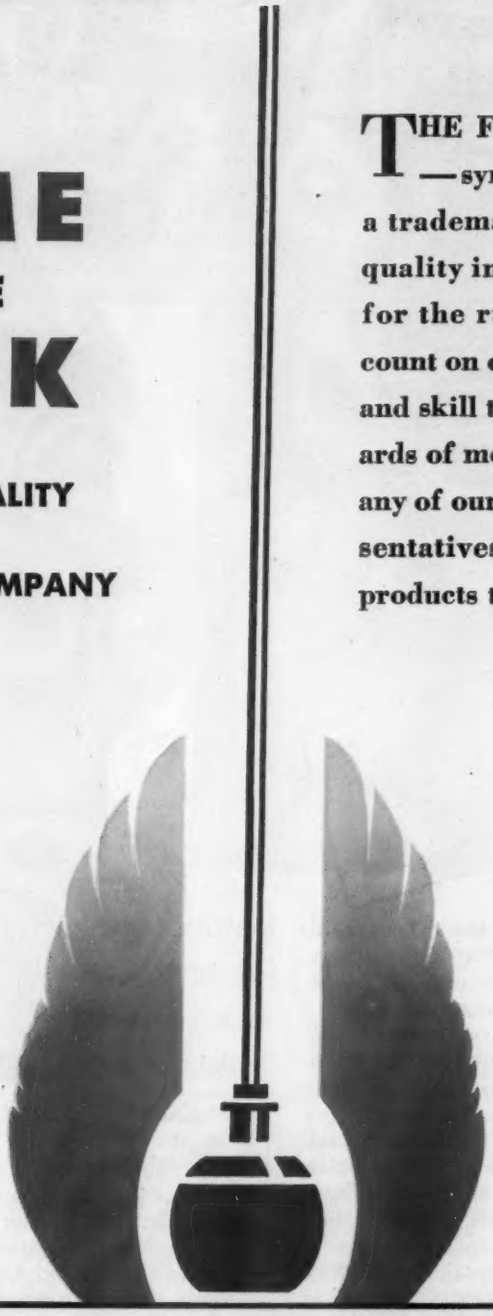

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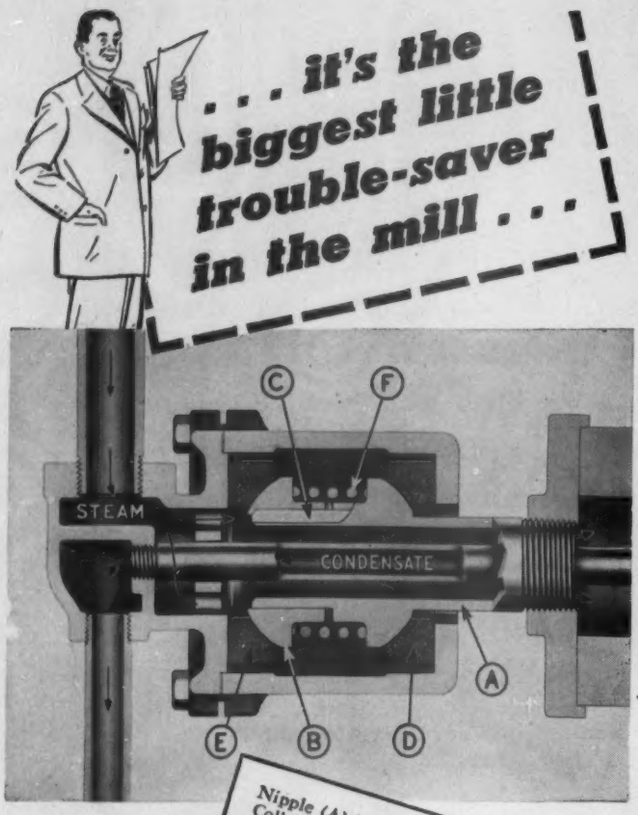

Nipple (A) is connected to roll or drum. Collar (B) is keyed to it (C), but fits loosely so pressure can fill entire housing to act as sealing force. Both seal ring (D) and bearing ring (E) are of carbon-graphite, eliminate packing and oiling. Spring (F) is for initial seating only. Type B Joint shown; other types, sizes for all needs.

In terms of physical size alone, the Johnson Joint could hardly be called big machinery. But in its ability to save time and trouble, and promote plant efficiency, its stature approaches anything the industry has ever seen.

The Johnson Joint was designed to go after the old stuffing box and steam fit troubles in a business-like way, and it literally knocks the stuffing out of them. There's no packing of any kind. There's no oiling required, ever. There's no adjusting — the higher the pressure, the tighter the seal. There's little to fear from misalignment — with provision for both lateral and angular movement built right in. Note besides how neatly it provides for more efficient syphon drainage, through the same head that admits the steam.

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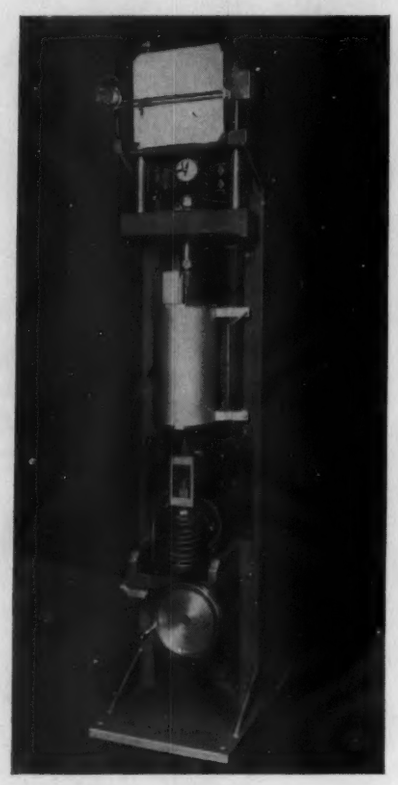
NEW EQUIPMENT

Baldwin Creep Testing Machine

A new motor-driven, screw-type creep testing machine of 20,000 lb. capacity, designed for short-time, creep-rupture tests at high temperatures, with a minimum of operator attention, is announced by the Baldwin Locomotive Works, Testing Equipment Department, Philadelphia 42, Penna. The machine automatically maintains constant loads up to 100,000 lb. per



sq. in. on standard 0.505-in. diameter specimens while temperatures are held constant up to 2200 deg. F. Tests of this type may run for 10 to 400 hours.

A feature of the machine is a flat 10-in. by 10-in. chart recorder panel in front, with which no extensometer is required and no strain readings need be made. This relieves the operator of giving much time and attention throughout the test and avoids drawing curves manually from recorded data. The elongation versus time curve is automatically and accurately drawn on the chart from the start of the test until rupture occurs. It assures much greater accuracy at the final point of the curve, or for plastic strain at rupture, than has hitherto been possible by the conventional practice of measuring after rupture by fitting the two broken ends of the specimen together.

The recorder panel is driven vertically with the elongation of the specimen by the driving mechanism of the loading screw. The recorder pen is driven horizontally by a clock mechanism. Elongation is also indicated by a revolution counter which can be read directly in thousandths of an inch. It is operated by direct flexible shaft connection with the screw jack drive shaft. Change

Fig. 1—15-ft. diameter by 45-ft. long horizontal vulcanizer with quick-opening door for vulcanizing rubber linings in large storage tanks. *Fig. 2*—Biggs vulcanizer with special heating manifolds and circulating fan; all sizes, various working pressures.

Biggs

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Fig. 3—vertical vulcanizer with quick-opening door. Door is handled by self-contained arm and gear-operating mechanism. Hand or motor operation.

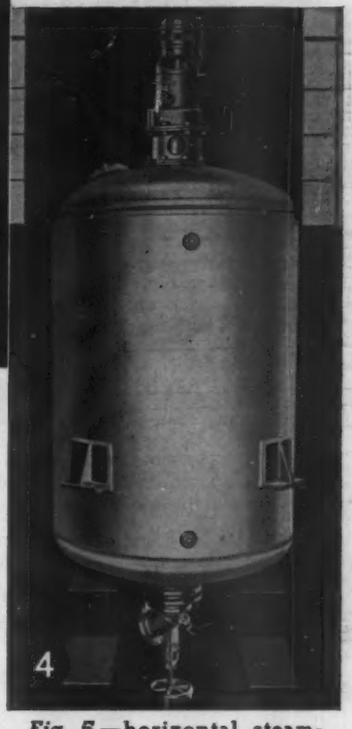
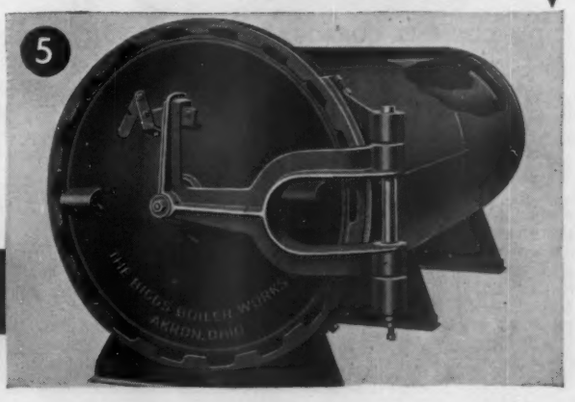


Fig. 4—high pressure heavy duty jacketed vertical devulcanizer with special agitator. Furnished in various sizes.

Fig. 5—horizontal steam-jacketed vulcanizer with hinge type quick-opening door; all sizes, for various working pressures. Welded construction throughout.

BIGGS-built vulcanizers and devulcanizers have occupied a prominent place in the development of the rubber industry since its inception. For more than 45 years Biggs has furnished single-shell and jacketed vulcanizers both vertical and horizontal, as well as many different types of devulcanizers to meet various requirements of the reclaim experts. . . . It is a far cry from the old days of bolted doors and riveted construction to Biggs modern all-welded units with quick-opening doors. Biggs vulcanizers and devulcanizers are available in all sizes and for various working pressures — with numerous special features. *Write now for our Bulletin 45.*



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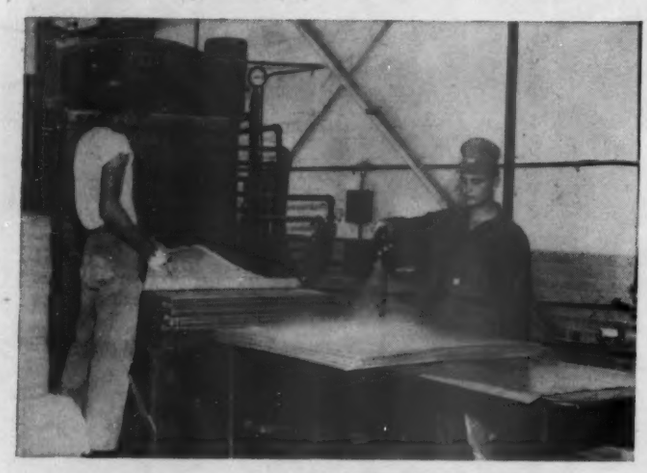

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DC Mold Release Emulsion No. 35 diluted with water gives easy release and improved finish in molding rubber floor tile.

Several months ago, the Robbins Tire and Rubber Company of Tuscumbia, Alabama, tested our silicone emulsion for molding floor tile. Their tests were so completely satisfactory that all production molds for floor tile are now lubricated with DC Mold Release Emulsion No. 35.

It's easy to use—no need for solvents, just dilute with pure water and spray it on your molds.

Molds stay cleaner longer—Silicone release agents are semi-inorganic and stable at temperatures far above those used in molding. They do not decompose to build up on the mold and they prevent adherence of mold dirt to the metal surfaces.

Moldings look better—high surface finish; fewer rejects from poor flow; practical elimination of surface blemishes.

It's economical, too—DC Mold Release Emulsion No. 35 is easily diluted with water and generally effective in low concentrations. Use only enough of the emulsion to secure easy release and good finish. At such concentrations, the cost compares very favorably with that of ordinary mold lubricants.

DC Mold Release Emulsion No. 35 is widely used in molding mechanical rubber goods, as a molding bag lubricant and as a spray for tire molds. Our sales engineers will be glad to help you make more profitable use of Dow Corning Silicone mold release agents in your plant.

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gears in the elongation drive to the recorder give 1, 2 and 4 percent elogations per inch.

The specimen is loaded below through gearing by means of a large, electric-motor-driven screw having a stroke of approximately 4 in. The top end of the specimen is supported by a stiff, heavy spring block on which the constant load is maintained by keeping a constant deflection. The deflection of the spring block is measured by a dial gage with an electrical contact. The electrical contact controls the motor that drives the screw. Thus, a constant deflection is maintained in the spring block and a constant load is applied on the specimen during its elongation. When the specimen ruptures, the control circuit (of which the specimen is a part) is broken and both motor and clock are stopped.

The new machine can also be adapted readily to short-time tensile tests, constant strain-rate tests, or relaxation tests. The machine weighs approximately 1200 lb., is 7 ft. high, and requires a 16-in. by 30-in. floor area.

Clarkstan Rubber Gauge

A new low cost, accurate rubber gauge, which measures the hardness of rubbers and other elastomers from 15 to 95 Shore, has been developed by the Clarkstan Corp., 11927 West Pico Blvd., Los Angeles 34, Calif. Of convenient size, the gauge may be easily carried in

the pocket. Each unit is supplied with a test block of known Shore hardness. Accuracy is said to be assured, since the unit has only one moving part without linkage. The scale is designed for easy reading. In use, the gauge is simply pressed against the sample to be measured.

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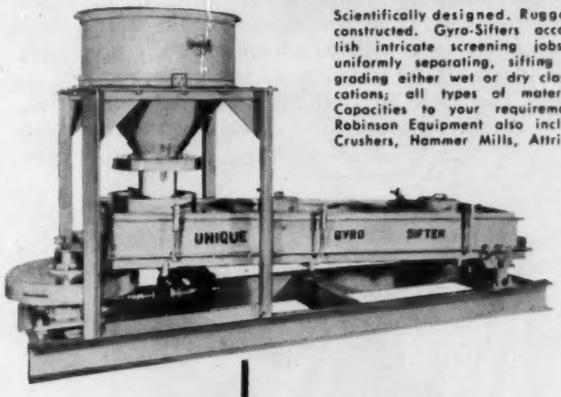

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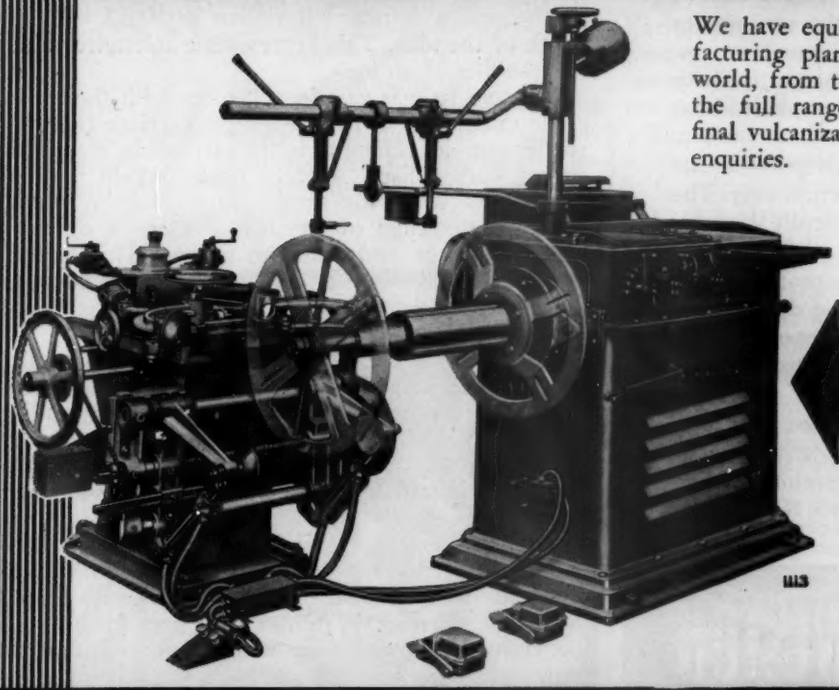
★ SAFE ★ NON-DISCOLORING
★ DELAYED ACTION ★ NON-BLOOMING
★ STABLE IN MASTER BATCHES

DU PONT RUBBER CHEMICALS
E. I. DU PONT DE NEMOURS & CO. (INC.)
WILMINGTON 98, DELAWARE
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY
DU PONT

Tyre Building Plant



We have equipped many tyre manufacturing plants in all parts of the world, from the bale splitter through the full range of equipment to the final vulcanization. Let us have your enquiries.

SHAW

Illustration shows our standard Giant Tyre Builder for tyres up to 13.50 x 20. The main stand houses the motor, which is designed for two forward speeds, reverse, inching and crawl. The side wall and tread stitchers are air operated, the latter being motor driven.

FRANCIS SHAW & CO. LTD. MANCHESTER 11 ENGLAND

R164

NEW—

all-metal WESTON

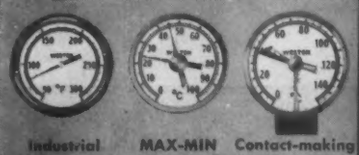
Contact-making

thermometer

This new Weston combines the features of an indicating device with the advantages of an alarm or control instrument. A contact arm, mounted as shown above, is easily set to make contact at any temperature on the scale.

A terminal block on the periphery of the case makes electrical connection easy. The thermometer is all-metal, typically WESTON in ruggedness and reliability, with accuracy of ±1% as an indicating thermometer, and ±1½% as a contact making device. It is supplied in two types—for operation on either increasing or decreasing temperatures.

For complete information see your local WESTON representative or write Weston Electrical Instrument Corporation, 705 Frelinghuysen Avenue, Newark 5, New Jersey.



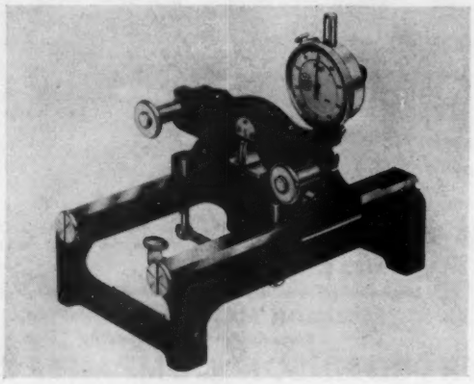
Industrial Thermometers | MAX-MIN Thermometers | Contact-making Thermometers

WESTON *Thermometers*

Avimo Micrometer-Controlled Tear Cutter

The accepted method of determining the tear resistance of rubber sheeting is to subject a sample of standard size and shape, the edge of which has previously been nicked, to a tensile tester with a standard rate of separation of the jaws. The usefulness of the result will depend upon the care with which samples are prepared, and particularly in the accuracy of the measurement.

A cutter designed by Imperial Chemical Industries, Ltd., to overcome the difficulty of cutting accurately a nick of 0.02 inch in samples of rubber sheeting was



described in an article in the June 22, 1946, issue of the *India-Rubber Journal* by J. M. Buist and R. L. Kennedy on "Tear Resistance," and the instrument is now produced commercially by Avimo, Ltd., of Taunton, Somerset, England. It is designed with particular regard to the difficulties experienced in testing sheeting of soft, unloaded rubber compound, and gum stocks, and an accuracy test carried out on 72 test pieces of 2 mm rubber sheets gave a standard deviation of .0013 inch in the depth of the nick. This represents a tolerance value ±3 thousandths of an inch.

A heavy base is cast in one piece with the machined guide rails along which the sample carriage travels. The rubber sample is clamped in the carriage by means of two spring loaded discs. A razor blade is held firmly in a clamp, and when the sample carriage is moved along the rails the edge of the blade enters a narrow slot in the carriage and cuts the rubber. The carriage is rebated to hold the test piece accurately, and is relieved in the neighborhood of the slot so that the rubber is here gripped firmly.

The height of the clamp which holds the razor blade is controlled by an adjustable screwstop, the movement of which is measured by a dial micrometer reading in 1,000th inch. A simple lever raises the razor clamp against its stop and at the same time lowers two stops on the guide rails to permit the carriage to slide over the razor blade.

The test piece of sheeting is placed in the carriage and the lever is depressed to allow the carriage to travel over the blade which should first be brushed with soap solution. The carriage is moved back and forth six times between the stops, then withdrawn and the sample removed.

The nick is measured by means of a microscope and the error taken up on the micrometer. Thus, if the nick is found to be .025 inches, the razor blade clamp stop is lowered by .005 inch measured on the micrometer dial, and the test repeated with a fresh sample.

Cady Model DW Exact Micrometer

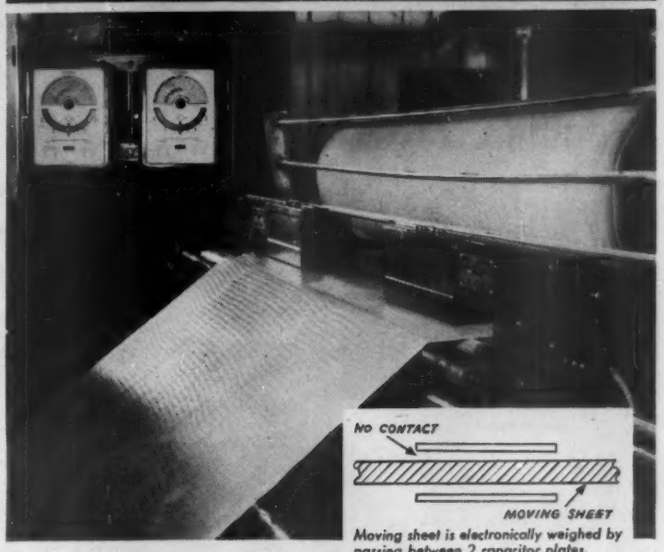
A new dead-weight thickness caliper which calipers thickness of sheet materials, including rubber sheet, or other articles up to ½-inch thickness, has been developed by E. J. Cady & Co., 134 North LaSalle St., Chicago 2, Ill. The dead weight principle employs devices to maintain uniform measuring pressure at all times, at any point of anvil travel, whether the article measured is thick or thin. The top lever lifts the anvil. It descends by gravity, a dash-pot action preventing too-rapid descent. The pressure per square inch meets ASTM and TAPPI standards.

The instrument is provided with zero adjusting devices, accessible from outside the frame, permitting the indicator to be set at exact zero on the dial. Internally, the mechanism is designed to prevent an accidental change of this zero adjustment and maintains perfect alignment of working parts. The dial is 6″ diameter, clearly marked (thousandths or half-thousandths of an inch graduations), glass covered, and located for convenient accurate reading.

FOR FURTHER DETAILS, SEE AD ON PAGE 264

Continuously! Electronically!

WEIGHS SHEET STOCK WITHOUT CONTACT



Moving sheet is electronically weighed by passing between 2 capacitor plates.

This Unique System automatically and continuously weighs calendered sheeted material in process . . . indicates instantly any variation in weight of material passing through measuring heads . . . and records weight in ounces per square yard or other suitable units.

By taking advantage of electronic principles, the Verigraph head measures without contacting material. Errors due to speed, surface irregularities and penetration of contacting-type measuring elements are eliminated.

This Foxboro Verigraph Recording System is used on rubber and plastic sheeting by such leading companies as Goodrich, Goodyear, Firestone, General, U. S. Rubber, and Dow Chemicals. It reduces rejects, improves uniformity, and can save tons of material annually. Write for Bulletin No. 234. The Foxboro Company, 256 Neponset Ave., Foxboro, Mass., U. S. A.

An exclusive Foxboro development, the Verigraph Weight Recorder applies the speed and sensitivity of electronics to weight recording. Simple to install and operate. Used by leading companies on critical calendering since 1926!

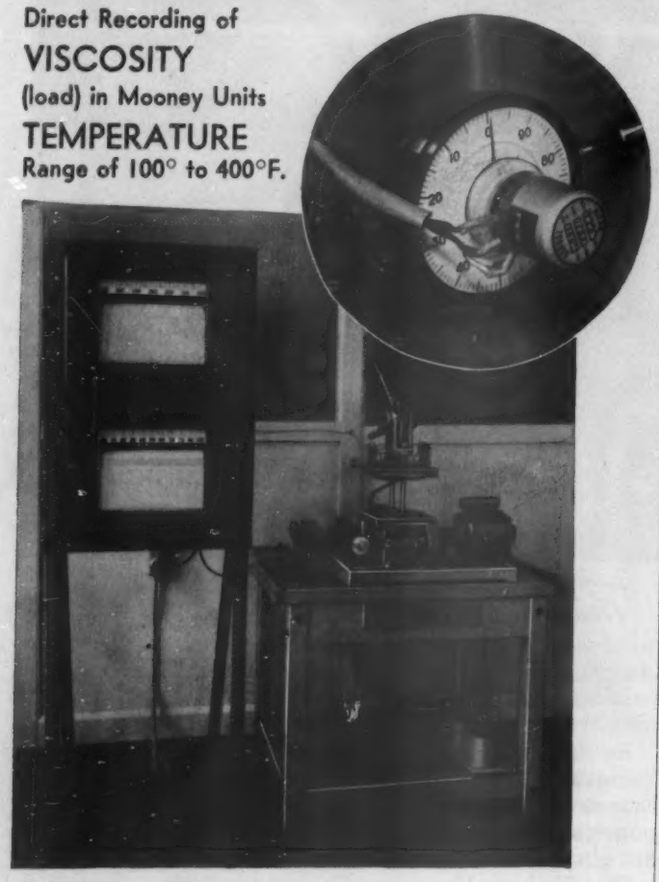
FOXBORO
REG. U. S. PAT. OFF.

RECORDING
CONTROLLING
INDICATING
INSTRUMENTS

TESTED IS TRUSTED

MOONEY SHEARING DISC VISCOMETER with new ELECTRONIC RECORDERS

Direct Recording of
VISCOSITY
(load) in Mooney Units
TEMPERATURE
Range of 100° to 400°F.



The viscosity recorder automatically charts the full curve of Viscosity and Scorch Characteristics of rubber compounds as determined by the Mooney Viscometer.* An exclusive Scott "pick-up" device (shown enlarged above) transmits the usual dial indicator readings of Mooney Units to the recorder chart.

The temperature recorder is actuated by Scott designed thermo-couples in the test sample area of the viscometer. PAMPHLET UPON REQUEST.

*Sole Licensee—Scott Testers, Inc.

SCOTT TESTERS, INC.

85 Blackstone St., Providence, R. I.

Standard of the World

Stanley Sponge Rubber Cutter

A new sponge rubber cutter has been introduced by Stanley Electric Tools, New Britain, Conn. A portable electrical tool, it is manufactured for use wherever sponge or foam rubber up to 4-inch thickness has to be cut. The operator can follow any marked-out pattern,

or follow a template, for cutting straight lines, curves or angles. The cutter can be operated at a speed of 30 feet a minute, depending on the thickness of the material. It is powered by a universal type motor which operates from either a.c. or d.c. The motor housing is a sturdy, lightweight aluminum alloy casting. The two saw-type blades that do the cutting are made of alloy steel and can be replaced easily.

Bristol Electronic Pyrometer Controller

The development of a proportional current-input electronic pyrometer controller has been announced by the Bristol Company, Waterbury 91, Conn. The new instrument proportions the current input to electrically-heated furnaces, ovens, plastic molding machines, salt pots, and other similar equipment to provide practically straight-line temperature control. It does this by time modulation of the input energy. The average energy supplied is proportional to the deviation of the temperature from the control point throughout a band width, which is adjustable from 0 to 2½ percent of full scale reading.

THE DAILY GUIDE
That is indispensable to buyers of Rubber

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SIMPLEX
REG. TRADE MARK

RUBBER STRIP CUTTER

PATENTED

A PORTABLE machine capable of stripping slab rubber up to 1″ thick at the rate of 20,000 feet in 8 hours. Any width desired.

SPECIAL FEATURES

- Has micro-adjustment for accurate widths.
- Equipped with water tank which feeds water to the slotted knife and to the cut.
- Has repulsion induction motor which carries any over loads.
- Automatic sharpener device keeps knife keen and sharp.
- Has base with rollers and is very easy to handle.

Cuts within 1/64 inch to 1/100 inch tolerance depending on grades of rubber. Cuts a slab down to the last shaving. Cuts all grades of rubber including pure gum, sponge, etc. Cuts squarely—no rejects.

Now in use by many leading Rubber Manufacturers & Jobbers

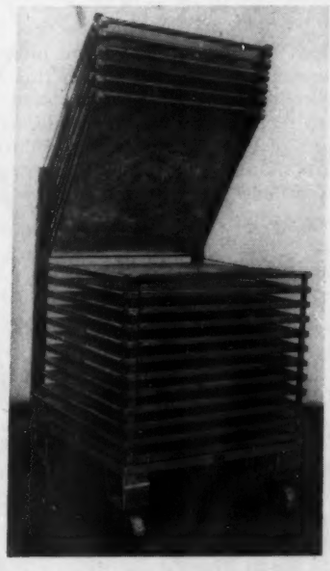
Simplex Cloth Cutting Machine Co., Inc.

Manufacturers of a Complete Line of Cloth Cutting Machinery

270 West 39th St. New York 18, N. Y.

Cable Address—SIMPLEX, N. Y. *Phone*—WIsconsin 7-5547

New Stock Cooling Rack



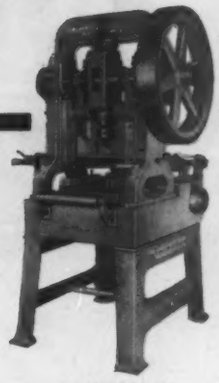
This new Rack gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Racks having 18 perforated trays 36″ x 36″ or plain surface trays 36″ deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

SPADONE MACHINE COMPANY

10 EAST 43rd ST. NEW YORK 17, N. Y.

Rubber Cutting Machines with a Lifetime of Uniform Quality

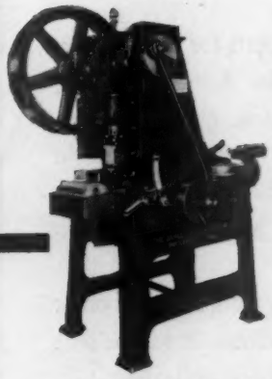
ENGINEERED TO MEET YOUR PARTICULAR REQUIREMENTS



MODEL A2

COULTER RUBBER CUTTING MACHINES have been used successfully for years and years in the cutting of continuous volumetric control and stripping for Heels, Soles, Taps and other molded products.

MODEL A1



- Model A1 for Heels at high speed production, or short runs.
- Model A2 for Multiple Heels, Half and Full Soles with stock grain.

MODEL A3

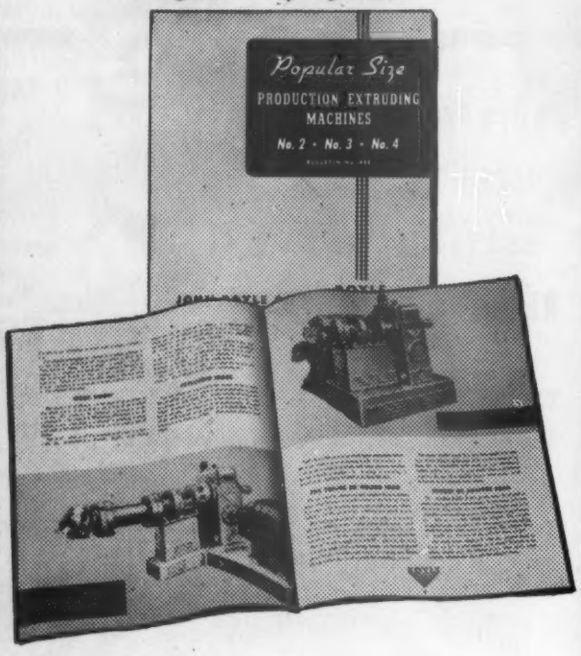
- Model A3 for Multiple Heels and Taps with or across stock grain.
- Model A2S (Not shown) for cutting crosswise of grain of stock.

PRODUCTION MACHINES SINCE 1896

The James **COULTER** *Machine Co.*

BRIDGEPORT • CONNECTICUT • U.S.A.

ROYLE
HAS PREPARED For You—



To meet the many requests for information concerning Royle "Popular Size" Extruding Machines, a fully illustrated, quick reference bulletin has been prepared describing the Royle # 2, # 3, and # 4 extruding machines — the extruders most commonly associated with current extrusion processes.

Please use the handy coupon below to order your copy of this useful bulletin. It will be sent to you promptly and without obligation.

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PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

Please send me Royle bulletin titled "Popular Size."

*Company*_____

*Name*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

REVIEWS

BOOKLETS, CATALOGS, etc.

Neoprene Vulcanizates. (Report No. 48-7). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6 x 9 in. 56 pp.

The data presented in this technical report shows the effect of varying amounts of five different types of carbon black and seven different types of non-black filler as to hardness, tensile strength, elongation at break, compression set, resilience, stress at various strains in tension and compression, and effective dynamic modulus of neoprene vulcanizates. Also illustrated in chart form are the changes which take place in the properties of neoprene vulcanizates when they are aged under various conditions or immersed in petroleum hydrocarbons. An example shows how the data may be used in designing a neoprene composition to meet the requirements of a specification.

•

Brown pH and Conductivity Recorders and Controllers. (Catalog 15-12). Brown Instrument Co., Philadelphia 44, Penna. 8 x 10½ in. 44 pp.

pH and conductivity control and their application to different industrial processes is a feature of this new catalog. Typical examples presented include pH control in heavy chemical and other industries and conductivity control in water treatment, power plants and the textile industry. The catalog also offers a discussion of the fundamentals of pH, oxidation-reduction potential and conductivity and describes various instruments such as the Electronik Potentiometer, the Beckman pH Amplifier, control valves, conductivity cells, motors and pneumatic control accessories. A partial list of circular and strip charts and scales and dimensional diagrams of pH equipment are also presented.

•

Studies in Centralized Lubrication: 1948. Farval Corp., 3293 East 80th St., Cleveland 4, Ohio. 8½ x 11 in. 8 pp.

Savings which have been effected in modern industry through Farval lubrication methods are outlined in this bulletin. Such matters as eliminating bearing repair and expense, saving oiling labor, stopping lubricant waste, eliminating down time from lack of lubrication, increased output, and improved safety conditions are discussed. Photographs and drawings illustrate the different points raised in the bulletin.

•

What Greer Multi-Tier Equipment Can Do For You. J. W. Greer Co., 119 Windsor St., Cambridge 39, Mass. 8½ x 11 in. 4 pp.

This pamphlet outlines the operation of the company's multi-tier equipment and its application to many production, processing and materials handling problems. To this end, a series of diagrams is provided which show the equipment in different phases of operation. Advantages provided through the use of multi-tier equipment as to time savings and conservation of floor space are discussed.

•

Johnstone Slitter Wheel Grinder. Johnstone Engineering & Machine Co., Parkesburg, Penna. 3½ x 8½ in.

Operating procedures and features of the score cut slitter wheel grinder made by the company are discussed in this two-color brochure. Outlines of the method in which the wheel grinder reconditions typical score cut slitter wheels used in the rubber and other industries are included. Photographs are provided.

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NATURAL LATEX

FROM SOCFIN CO., LTD., MALAYA

TANK CARS OR DRUMS

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RPA NO. 3

RUBBER PEPTIZING AGENT

by

DU PONT

★ Shortens Breakdown Time

★ Reduces Breakdown Cost

★ Increases Capacity of Processing Equipment

★ Improves Processing Quality of Rubber Stocks

DU PONT RUBBER CHEMICALS

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WILMINGTON 98, DELAWARE

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

DU PONT

why not let

pleasant odors

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Whether intended for the manufacture of balls, girdles, toys, gloves, hot-water bottles, shower curtains, or other household or industrial purposes, your rubber will find readier acceptance if it is odor-treated by Sindar.

*paradors**

Sindar's special aromatic blends for use in rubber, are

effective, inexpensive, tenacious, time-tested

Ask us for further information, samples and prices.

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A PROCESSING AID FOR THE MANUFACTURE OF FLOOR TILE

Use 12 volumes of SOLKA-FLOC to replace an equal volume of mineral filler to obtain:

EASIER PROCESSING STOCKS

- better plasticity
- lower batch temperature
- less power consumption

BETTER FINISHED TILING

- resilience with hardness
- high dimensional stability
- smoother surfaces

For further information and samples, write to our Technical Service Department.

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REVIEWS (CONT'D)

Production Management (1948 Edition). Albert Ramond and Associates, Inc., Tribune Tower, Chicago 11, Ill. 8½ x 11 in. 48 pp.

This booklet reviews some of the major current questions relating to production, wages, costs, quality and labor relations. It presents answers which actual experience have proven to be effective and workable. Some of the specific problems discussed are productivity and the human factor, technological improvements, wages and incentives, etc. A section of the booklet is devoted to an outline of the company, its objectives and its work in providing an engineering consulting service on production management problems.

•

Chlorine. Columbia Chemical Division, Pittsburgh Plate Glass Co., Pittsburgh 22, Penna. 8½ x 11 in. 72 pp.

Designed for the use of operators, technicians, buyers and executives, this manual presents charts, diagrams and photographic illustrations concerned with the production and handling of chlorine and several of its end products. After tracing highlights in the history and growth of the industry, the manual enters a detailed discussion of the methods of manufacture, handling and unloading. Safety precautions, shipping, equipment and construction materials receive consideration. Tables on conversion factors are included.

•

Natural Rubber Latex. Testworth Laboratories, Inc., 407 South Dearborn St., Chicago 5, Ill. 9 x 11 in. 12 pp.

The purpose of this brochure is to acquaint the layman, who is using or considering the use of straight (uncompounded) natural rubber latex, with certain fundamental information. Matters such as origin and types of latex are considered, as are the properties of concentrated latices, handling and storage, compounding, and calculations, costs and prices. A table is offered which shows the properties of concentrated latices including centrifuged and creamed for natural as well as GR-S and neoprene latices.

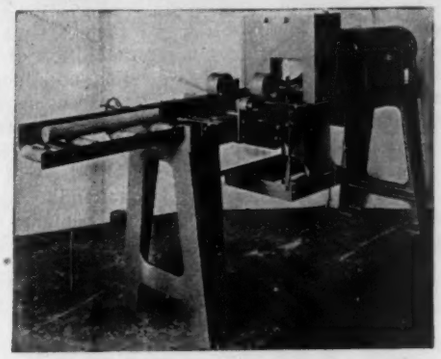
•

Stauffer Chemicals. Stauffer Chemical Co., 420 Lexington Ave., New York 17, N. Y. 8½ x 11 in. 108 pp.

Included in the pages of this catalog are complete descriptions of all the Stauffer chemicals, their properties, grades, analyses, principal uses, packing, shipping regulations and stocks. Also included are baume tables, dilution formulas, equivalents, general data, and miscellaneous tables for ready reference. The booklet is illustrated with photographs and is bound in handy loose-leaf style.

FOR FURTHER DETAILS, SEE AD ON PAGE 264

SLICER MACHINE FOR EXTRUDED STOCKS



With High Speed Disc Cutting Blade, Automatic Feed and with Tandem Feed Wheels. Capacity Section Up to 3" by 4½"—Length ⅛" to 4".

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MILWAUKEE—SHERIDAN 4-7020

Pocket THICKNESS MEASURES

For measuring to .0005" and less, *at-a-glance, anything* —from hardest metal to softest rubber!

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FEATURES: Automatic, uniform contact pressure—everyone gets the same speedy, accurate readings. Weight only 1⅛ ounces. Case thickness ¼". Dial 1⅝" dia. Fixed parallel contacts ¼ dia. Direct-reading count hand. Forged aluminum alloy case.

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Mfr. of Micrometer Dial Gauges
Micrometer Dial Indicators
Representatives in principal cities

Weathering qualities of RUBBER PRODUCTS determined with reliable accuracy in the

ATLAS *twin arc* WEATHER-OMETER

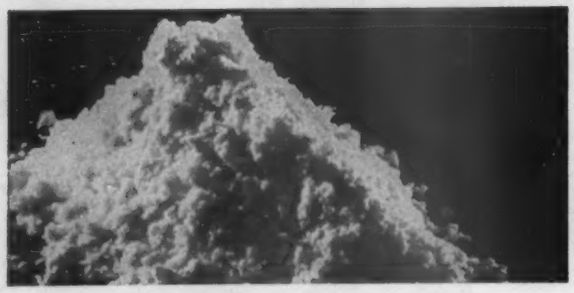
Any selected cycle of exposure to sunlight and wetting can be set for automatic continuous testing in the Weather-Ometer. Exact tests can be duplicated at any time by settings on the control panel which contains temperature regulator—time meter—light and water cycle switch — automatic cut-off switch — voltage adjusting switch — direct reading thermal regulator — reactance coil (for economical current consumption). The Weather-Ometer is fully automatic in operation; can be left unattended over night; only necessary to renew carbons once in 24 hours. Years of exposure to any conditions of weathering reduced to a few days testing in the laboratory with the Weather-Ometer.

Originators and sole manufacturers of accelerated testing machines for over a quarter of a century. Fade-Ometer, Weather-Ometer, Launder-Ometer — the accepted standard testing machines used all over the world.

ATLAS ELECTRIC DEVICES CO.
361 West Superior Street, Chicago 10, Illinois

Rayco Fillers

For Non-Marking Sole Compounds



"FILFLOC"

REGISTERED UNDER U. S. No. 431,067

Early in our pioneering efforts as flock producers, we recognized that the special needs of the Rubber Industry call for a special group of fillers. Here in "Filfloc" is a product developed specifically to enhance strength, as well as impart non-marking qualities. Through experience and joint research with you, we furnish various types of "Filfloc" to meet EXACTLY your needs for compounding crude, synthetic or reclaim.

REQUEST FREE WORKING SAMPLES

Rayon Processing Co. of R. I., Inc.

PIONEER PRODUCERS OF COTTON FILLERS FOR PLASTICS

100 MOSHASSUCK ST., PAWTUCKET, RHODE ISLAND

Hard Rubber & Plastics Handbook. American Hard Rubber Co., 11 Mercer St., New York 13, N. Y. 6 x 8½ in. 56 pp.

The purpose of the handbook is to inform design and production engineers on the technical possibilities of adapting hard rubber to various articles. To this end, suggestions have been set forth intending to assist those using hard rubber in solving problems relating to mold design, metal inserts, including approved shop practice for performing various operations of machining and finishing molded parts and raw materials, rods, sheets, tubes, etc. The handbook is bound in convenient loose-leaf style and provides many diagrams, tables, charts and photographs.

•

Wheelco Thermocouple Manual. (Bulletin T/C 7). Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill. 8½ x 11 in. 40 pp.

This illustrated manual provides information on the selection of proper thermocouples and protecting tubes, methods of checking thermocouples and pyrometers, and installation data. It describes thermocouples, thermocouple wire, lead wire, heads, connectors, plug and socket assemblies, insulators, protecting tubes and radiation heads. Temperature-millivolt curves, resistance tables, pipe and wire sizes and lead wire conduit capacity are furnished in chart form in a separate section of the manual.

•

Di-Acro System of Die-less Duplicating. (Catalog No. 48-14). O'Neil-Irwin Manufacturing Co., Lake City, Minn. 8½ x 11 in. 40 pp.

This latest edition of the Di-Acro catalog outlines many new machines which have been developed during the past months, as well as other machines which have been in production and use for some time. How die-less duplicating works is discussed, and operations and features of the individual machine in various specific applications are considered. A section of the catalog is devoted to the company's engineering service which is available to industry.

•

Something About the Senses. Monsanto Chemical Co., St. Louis 4, Mo. 5½ x 7½ in. 32 pp.

The ink with which this booklet was printed was scented with Coumarin Monsanto, and serves to illustrate one of the uses of the chemical in making every-day objects more appealing to the senses. Other products discussed include Ethavan, methyl salicylate, and vanillin, and their uses in products ranging from cosmetics to foods. Specifications as to their properties are included as are different solubility tables.

•

Cast Iron Pulleys for Industry. (Bulletin P-848). Sprout, Waldron & Co., Muncy, Penna. 8½ x 11 in. 16 pp.

This bulletin describes the company's line of "Blue Face" pulleys. Designed to facilitate quick and easy reference, the bulletin includes such matters as how to order the pulleys, specifications, extras, weights, etc. Belt-saver and ball-bearing loose type pulleys are discussed. Illustrations of varied and typical installations of pulleys on the job are included.

•

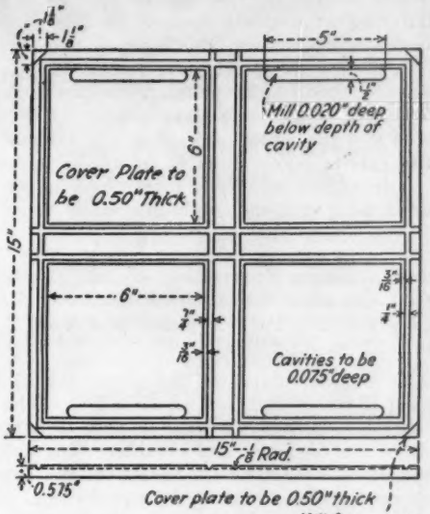
Wheelco Electronic Controls. (Bulletin No. Z-6500). Wheelco Instruments Co., Harrison & Peoria Sts., Chicago 7, Ill. 8½ x 11 in. 8 pp.

Containing a listing of standard instrument models manufactured by the company, this bulletin is arranged in handy loose-leaf style. Wheelco recorders, controllers, indicators and combustion safeguards are discussed and illustrated, as are input controllers and thermocouples.

HOGGSON BRAND
Since 1849

MOLDS & DIES
FOR
RUBBER TESTING

ONE OF THE MANY MOLDS AVAILABLE



Molds from 7" to 24" sq. for tension samples, and molds for compression samples if desired. Molds in dimensions varying from 1" x 1" x 1/4" up for abrasion test samples. Molds and dies for slab curing. Please describe your need.

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Stamford

"Factice" Vulcanized Oil

(REG. U. S. PAT. OFF.)

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We point with pride not only to a complete line of solid Brown, White, "Neophax" and "Amberex" grades, but also our aqueous dispersions and hydro-carbon solutions of "Factice" for use in their appropriate compounds.

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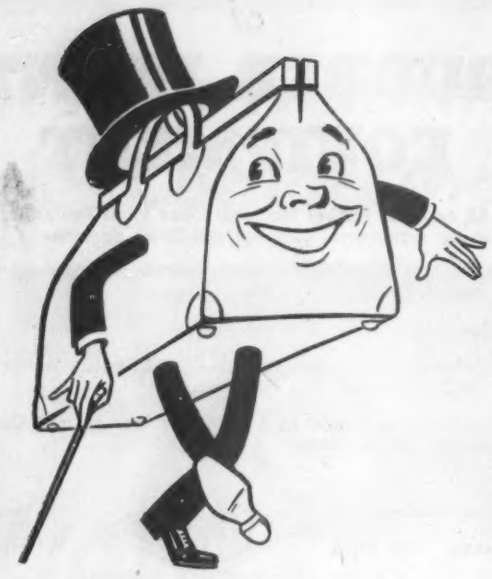
Makers of Stamford "Factice" Vulcanized Oil Since 1900
(REG. U. S. PAT. OFF.)



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Vistanex. Enjay Co., Inc., 15 West 51st St., New York 19, N. Y. 9 x 11 in. 48 pp.

Offering a complete resume on the processing and compounding of Vistanex, this manual provides an examination of the use of the product in plastic films and coatings, adhesives, emulsions, tank lining compositions, asphalt compositions, etc. The general properties of the product are presented and the effect of Vistanex in various natural and synthetic rubber compounds is included. A listing of suppliers of trade-named materials mentioned in the pamphlet is appended as is a complete bibliography.

•

Indulin: Lignin From Pine Wood. (Bulletin L-5). Industrial Chemical Sales Division, West Virginia Paper and Pulp Co., 230 Park Avenue, New York 7, N. Y. 8½ x 11 in. 32 pp.

This booklet discusses the chemistry of lignin, and gives typical analyses for Indulin A and C. The solubility of the product in various solvents is also discussed. The uses of Indulin are outlined, and complete biographies on suggested applications are included. Some of the products and industries covered are: rubber, resins, plastics, inks, lacquers, dispersing agents, wetting agents, and emulsions.

•

A Simplified Guide to Bakelite and Vinylite Plastics. Bakelite Corp., 300 Madison Ave., New York 17, N. Y. 8½ x 11 in. 24 pp.

Intended as a compact businessman's guide to both thermoplastic and thermosetting plastics, this booklet is a comprehensive, illustrated catalog of the many types of Bakelite and Vinylite plastics produced by the company. It provides informative data on such subjects as molding and extrusion materials, laminating plastics, coatings and adhesives, impregnating and sealing materials, film and sheeting, and fibers and yarns.

•

Santicizer 141: The Safe Plasticizer. Monsanto Chemical Co., 1700 South Second St., St. Louis 4, Mo. 6 x 9 in. 16 pp.

Technical data on Santicizer 141, particularly on its fire resistant properties, are given in this booklet. Data given includes flame-out time for polyvinyl chloride film, hardness, abrasion resistance, low temperature flexibility, volatility, and water and oil resistance. General properties of the material are also furnished. Santicizer 141 is a phosphate-type plasticizer developed especially for use in vinyl plastics.

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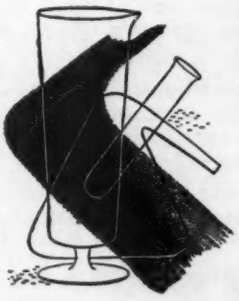

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Akron, Boston, Trenton, Chicago, Denver, Los Angeles

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, DECEMBER 8, 1948

Natural Rubber

The price of spot rubber on the Commodity Exchange has swung in a range of 3.75 cents since our last report (November 8), high for the period being 21.75 cents reached on November 24, and low 18.00 cents reached on November 30. The average price of spot rubber for the month of November was 20.52 cents based on 19 trading days. This compares with an average of 22.13 cents for October.

Rubber prices during this period have declined to a point where they approximate the price for general purpose synthetic rubber. For the first time since March, natural rubber at one point undersold the domestic manufactured substitute on the Commodity Exchange. Trade circles were of the opinion that most of the weakness lay in the London market, and that the New York market took its cue from the action abroad.

World production of natural rubber in October was set at 125,000 long tons, a decline of 20,000 tons from the figure set by the Secretariat of the Rubber Study Group for September. World rubber production for the first ten months of the year was estimated at 1,247,500 tons, up 215,000 tons from the corresponding 1947 period. Consumption of natural rubber in October, influenced as before by large imports into Russia which are accounted for as consumption, was estimated at 130,000 tons.

Russian buying of natural crude rubber, reported at more than 15,000 long tons for some months, is expected to be curtailed for the balance of the year. During the year Russia has become second only to the United States as a volume purchaser of rubber.

Today's quotations in the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.19
December	.18⅞
January-March	.18¾
Thin Latex Crepe:	
Spot	.22½
January-March	.22¼
Thin Brown Crepe, No. 2	.14⅞
Ambers, No. 3	.14⅞
Flat Bark Crepe	.11⅞

London Market

(Standard Smoked Sheets)

January-March	18.43 - 18.53
April-June	17.85 - 17.96

Singapore Market

(Standard Smoked Sheets)

December	17.00 - 17.10

Synthetic Rubber

(Dry Types-Per Pound)

Butaprene NF	.390 - .415
Butaprene NL	.400 - .425
Butaprene NAA	.440 - .465
Butaprene NXM	.470 - .495
Chemigum 30 N4NS	.400 - .470
Chemigum 50 N4NS	.400 - .470
Chemigum N3	.450 - .520
Hycar OR-25	.400 - .425
Hycar OR-15	.470 - .495
Hycar OS-10	.400 - .425
Neoprene Type E	—— - .650
Neoprene Types CG and AC	—— - .500
Neoprene Types FR and KNR	—— - .750
Neoprene Type S	—— - .320
Perbunan 18	.430 - .450
Perbunan 26	.440 - .460
Perbunan 35	.510 - .530
Silastic (compounded)	.235 - .440
Thiokol Type A	.370 - .470
Thiokol Type ST	.750 - .850
Thiokol Type FA	.520 - .620
Thiokol PR-1	.750 - .850

Scrap Rubber

The demand for scrap rubber still remains rather quiet. Trade circles seem to feel that the only solution to the apathetic scrap rubber market lies with export conditions. There is said to be considerable interest in Europe and the Far East, but monetary problems are almost insurmountable. The price structure remains substantially the same. Current quotations follow:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$12.00
Beadless truck tires	ton	nom.
Mixed truck tires	ton.	12.00
Beadless passenger tires	ton	nom.
No. 1 passenger peelings	ton	42.50
No. 1 truck peelings	ton	42.50
Red passenger tubes	lb.	.06¼
Black passenger tubes	lb.	.03½
Mixed passenger tubes	lb.	.03¾
No. 2 truck tubes	lb.	nom.
Red truck tubes	lb.	.06
Black truck tubes	lb.	.03
Buffings	ton	15.00

Reclaimed Rubber

Preliminary estimate for the consumption of reclaim during October was set at 22,959 tons compared with the 23,478 tons consumed during September. Consumption of reclaim for the first ten months of 1948 totaled 229,349 tons. The market has assumed a firmer tone with demand running heavy, while prospects for continuing demand seem good. Prices for reclaim remain the same. Current quotations follow:

Tires

Black, Acid	lb.	.08¾ - .09¼
Black, Digester	lb.	.08½ - .09
Peels	lb.	.09 - .09½
GR-S Whole Tire	lb.	.08½ - .09

Inner Tubes

Black	lb.	.12¾ - .13¼
Red	lb.	.13½ - .14½
GR-S	lb.	.10¼ - .10¾
Butyl	lb.	.08½ - .09

Shoe

Unwashed	lb.	.08¼ - .08¾

Cotton Tire Fabrics

While some gains were evidenced in the market, the general demand for cotton tire fabrics remains at fairly low levels. The market has been slowed largely because of the loss of the export market due to foreign dollar difficulties. Prices which were adjusted in recent months are now expected to hold. Current quotations follow:

Standard, Peeler, 12/4/2	lb.	.74
Standard, Peeler, 14/4/2	lb.	.76
Standard, Peeler, 16/4/3	lb.	.7850
Extra Staple, Peeler, 12/4/2	lb.	.8315
Extra Staple, Peeler, 14/4/2	lb.	.8575
Extra Staple, Peeler, 16/4/3	lb.	.8825

Chafers

14.4 oz. (per sq. yard)	lb.	.7400
9.25 oz. (per sq. yard)	lb.	.6975
11.65 oz. (per sq. yard)	lb.	.6700
8.9 oz. (per sq. yard)	lb.	.7125

Cotton

The price of middling uplands on the Cotton Exchange has swung in a range of 1.06 cents since our last report (November 8), high for the period being 33.01 cents reached on December 6, and low 31.95 cents reached on November 9 and 10. The average price of middling uplands for the month of November was 32.15 cents based upon 23 trading days. This compares with an average of 32.01 cents for the month of October.

Cotton prices have moved upward moderately during this period with the widest daily price ranges in some time. The outlook for exports seemed to have improved somewhat, and owing to the low stocks of cotton abroad, it was believed that a large amount of cotton would move during the next few months to Europe and Asia.

ECA has reported authorizations for the purchase of $87,970,000 worth of cotton by European countries and China. The largest amount was for France with $59,000,000 authorized, the cotton to be shipped by the end of this year. This is the largest purchase by ECA in the last seven months. Authorizations for the first quarter of 1949 included $10,000,000 for the Netherlands; $2,700,000 for Austria; $670,000 for Denmark; and $15,000,000 for China.

The cotton market, which had expected a continuance of a loan over 30 cents for next season's crop, now agrees that the loan this year will get between five and six million bales. Trade circles are of the opinion that the newly-elected Congress will be opposed to high loan rates as an inflationary factor.

Quotations for middling uplands on the Exchange follow:

	Nov. 8	December 8		
	Close	High	Low	Close
December	31.43	32.54	32.25	32.33
March	31.48	32.50	32.23	32.29
May	31.45	32.32	32.02	32.11

Closing Rubber Prices on New York Commodity Exchange

FROM NOVEMBER 9 TO DECEMBER 8

Date Nov.	Spot	Mar.	May	July	Sept.	Sales
9	21.00	20.40	20.40	20.25	20.15	44
10	20.62	20.25	20.20	20.05	19.95	59
11	——	——	——	——	——	——
12	20.38	19.90	19.90	19.60	19.50	53
13	——	——	——	——	——	——
14	——	——	——	——	——	——
15	20.25	19.25	19.15	19.05	18.95	81
16	20.25	18.95	18.85	18.75	18.65	86
17	20.50	18.85	18.80	18.70	18.60	109
18	20.62	18.97	18.86	18.70	18.60	75
19	20.75	19.00	18.92	18.75	18.65	42
20	——	——	——	——	——	——
21	——	——	——	——	——	——
22	20.62	18.92	18.85	18.65	18.55	16
23	21.50	19.20	19.05	18.90	18.80	50
24	21.75	18.55	18.40	18.40	18.15	102
25	——	——	——	——	——	——
26	20.00	18.60	18.43	18.30	18.15	29
27	——	——	——	——	——	——
28	——	——	——	——	——	——
29	18.25	17.70	17.55	17.40	17.25	174
30	18.00	17.50	17.35	17.20	17.05	25
Dec.						
1	18.25	17.90	17.65	17.55	17.40	54
2	18.50	18.17	18.01	17.85	17.75	59
3	18.88	18.40	18.35	18.15	18.00	73
4	——	——	——	——	——	——
5	——	——	——	——	——	——
6	18.25	17.80	17.67	17.56	17.42	87
7	18.38	17.98	17.86	17.75	17.60	70
8	18.75	18.58	18.42	18.30	18.15	122

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Photograph courtesy Cat's Paw Rubber Co.

With Mold Lubricant #735, maintenance cost is almost eliminated. For the last three years, our Mold Lubricant has been used by the Automobile Tire Dealers in their recapping operations. They have known it as the one lubricant that cleans as it lubricates. Having an ash content of less than .01%, it forms no carbon but has a cleaning compound formulated into it, to clean dirty and carboned molds.

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New Tools for Industry
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POLYSIZE RESIN EMULSIONS
Raw Materials for Better Textile Finishes

Polysize Resin Emulsions enable the finisher to combine the best qualities of *plastics* with *textile fibres*. Progressive manufacturers of textile finishes will want to know more about the Polysize Resin Emulsions listed below.

POLYSIZE 117-H

1. Permanent starching of cotton piece goods. On a dry basis, 117-H is many times more effective than starch in imparting firmness. Use Polysize 332 where smooth ironing is required.
2. Bodying, dulling, weighting and stiffening nylon, rayon and silk goods.
3. Launderproof and dry-cleaning proof permanent stiffener for cotton goods used as inserts for collars (including shirt collars) and lapels.

POLYSIZE 177

1. In combination with clays, talc and pigments, as a flexible filling and weighting finish for cotton, rayon and linen goods. Helps prevent dusting in brittle finishes.
2. As an extremely launderproof and dry-cleaning proof finish for rayon, nylon and cotton goods.
3. With non-permanent finishes such as starches or gums to give improved fastness.
4. As an addend to pigments for printed goods to reduce crocking. Also available in harder and softer grades.

POLYSIZE 220

1. Used alone or as a supplement to POLYSIZE 117-H for dulling nylon, rayon and silk.
2. Imparts dulling effect and a pearlescent sheen to rayon goods without rendering stiffness.

POLYSIZE 311

1. Flexible, non-chalking finish for ribbon stock. Imparts weight and excellent handle.
2. Slip-proof finish for nylon and rayon. Good dry-cleaning resistance.
3. Sprayed top-coat finish for woven paper goods (auto seat covers) to impart lustre.

POLYSIZE 328 "AQUAMER"

A water soluble sodium salt of a high molecular weight polymeric acid for warp sizing. Available as a thick gel of 25% solids.

Write today for Technical Data Sheet and working samples.

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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

DECEMBER 8, 1948

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

[a] East of Mississippi.

—The arrangement of this section follows closely the Chemical Section of the 1947 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.

—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.

—All requests for information or listings should be sent to Market Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

ACCELERATORS

A-1	lb.	.34	.39
A-10	lb.	.40	.47
A-19	lb.	.52	.58
A-32	lb.	.59	.69
A-77	lb.	.42	.55
A-100	lb.	.42	.55
Accelerator No. 8	lb.	—	.75
Accelerator No. 49	lb.	.44	.45
Accelerator No. 89	lb.	—	1.20
Accelerator No. 122	lb.	—	1.30
Accelerator No. 552	lb.	—	1.63
Accelerator No. 808	lb.	.59	.61
Accelerator No. 833	lb.	1.13	1.15
Acrin	lb.	—	.65
Altax	lb.	.35	.37
Arazate	lb.	—	2.16
Beutene	lb.	.59	.64
B-J-F	lb.	.27	.32
Butasan	lb.	—	1.00
Butazate	lb.	—	1.00
Butyl Eight	lb.	1.00	1.05
Captax	lb.	.27	.29
C-P-B	lb.	—	1.95
Cumate	lb.	—	1.45
Cuprax	lb.	.60	.62
Dibenzo G-M-F	lb.	—	2.65
Diorthotolyguanidine	lb.	.48	.50
Diphenylguanidine	lb.	.39	.45
El-Sixty	lb.	.39	.46
Ethasan	lb.	—	1.00
Ethazate	lb.	—	1.00
Ethyl Thiurad	lb.	—	1.00
Ethyl Tuex	lb.	—	1.00
Formaniline	lb.	—	.40
G-M-F	lb.	—	2.50
Good-rite Erie	lb.	.31	.33
Guantal	lb.	.47	.54
Hepteen	lb.	.42	.48
Base	lb.	1.80	1.90
Ledate	lb.	—	1.00
Mercaptobenzothiazole	lb.	.27	.32
Mercaptobenzothiazyl Disulfide	lb.	.35	.40
Methasan	lb.	—	1.00
Methazate	lb.	—	1.00
Monex	lb.	—	1.10
Mono Thiurad	lb.	—	1.10
Morfex 33	lb.	.53	.58
2-MT	lb.	.58	.60
Novac	lb.	—	1.40
A-13	lb.	.65	.67
O-X-A-F	lb.	.34	.39
Pentex	lb.	.74	.84
Flour	lb.	.12¼	.13¼
Phenex (tons)	lb.	—	.40
Pipazate	lb.	—	1.53
Pip-Pip	lb.	—	1.80
R-2 Crystals	lb.	—	1.75
RN-7 (dms.)	lb.	—	1.65
Rotax	lb.	.35	.41
SA 52	lb.	—	1.10
SA 57	lb.	—	1.00
SA 62	lb.	—	1.00
SA 66	lb.	—	1.45
SA 67	lb.	—	1.00
SA 77	lb.	—	1.00
Safex	lb.	—	1.15
Santocure	lb.	.55	.62
Selazate	lb	—	1.45
Selenac (Ethyl, Methyl)	lb.	—	1.45
Setsit-5	lb.	.75	1.00
SPDX-GH (tons)	lb.	.64	.69
Tellurac	lb.	—	1.45
Tepidone	lb.	—	.55
Tetrone	lb.	—	1.25
A	lb.	—	1.85
Thiocarbanilide	lb.	.34	.39
Thiofide	lb.	.35	.42
Thionex	lb.	—	1.10
Thiotax	lb.	.27	.34
Thiurad	lb.	—	1.10
Thiuram E (and M)	lb.	1.00	1.10
Trimene	lb.	.54	.64
Base	lb.	1.03	1.18
Triphenylguanidine	lb.	—	.83
Tuads (Ethyl, Methyl)	lb.	1.00	1.10
Tuex	lb.	—	1.10
Ultex (tons)	lb.	—	1.00
Unads	lb.	—	1.10
Vreka	lb.	.55	.62
Blend B	lb.	.55	.62
C	lb.	.52	.59
Vitasan Crystals	lb.	.48	.53
Vulcanex	lb.	—	.45
Z-B-X	lb.	—	2.45
Zenite	lb.	.33	.35
A	lb.	.42	.44
B	lb.	.39	.41
Zenite Special	lb.	.34	.36
Zetax (coated)	lb.	.33	.35
(uncoated)	lb.	.34	.36
Zimate (Butyl, Ethyl)	lb.	—	1.00
Zimate, Methyl	lb.	—	1.00

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.15¼	.15½
Fish Oil, Hydrogenated, Fatty Acid			
Hydrofol Acid (dlvd.)	lb.	.20¾	.24¼
Hyfac 430 (dlvd.)	lb.	.21	.22
Neo-Fat H.F.O. (dlvd.)	lb.	.27	.28
Stearex Beads (dlvd.)	lb.	.28	.29½
Lime, Hydrated			
Arrowhead	ton	16.00	19.50
Sierra	ton	16.00	19.50
Litharge			
Eagle (dlvd.)	lb.	.1925	.2025
FBS (dlvd.)	lb.	.1935	.2035
Magnesium Oxide, Heavy			
General Magnesite	lb.	.05½	.08
Michigan No. 15	lb.	.0550	.0600
Permanente	lb.	.05	.06½
Magnesium Oxide, Light			
Baker's (Neoprene Grade)	lb.	—	.28
General Magnesite (Neoprene Grade)	lb.	—	.28
General Magnesite No. 101	lb.	—	.175
General Magnesite Standard	lb.	—	.22
K & M (Neoprene Grade)	lb.	—	.31
Maglite "M" (l.c.l.)	lb.	—	.28
Marine's (Neoprene Grade (l.c.l.)	lb.	—	.28
Michigan No. 30	lb.	—	.22½
No. 40	lb.	—	.2800
Witco Extra Light	lb.	.25	.27
Oleic Acid			
Emersol 210 (dlvd.)	lb.	.17½	.19¾
L.C.P. Red Oil	lb.	.25½	.27¼
Red Oil (20-24 Saponified) (dlvd.)	lb.	.30½	.32¾
Palm Oil Fatty Acid (c.l.)	lb.	—	.11

ACTIVATORS (Cont'd)

Potassium Oleate (drums)	lb.	—	.29½
Red Lead			
No. 2 RM (dlvd.)	lb.	.2075	.2175
Sodium Laurate (drums)	lb.	—	.19
Sodium Oleate—Powder (drums)	lb.	—	.35
Paste (drums)	lb.	—	.20
Sodium Stearate—Powder (drums)	lb.	—	.35
USP Grade (drums)	lb.	—	.37
Stearic Acid, Single Pressed			
Emersol 110 (dlvd.)	lb.	.24	.25
Stearex B (dlvd.)	lb.	.31½	.32½
Stearic Acid, Double Pressed			
Alba (dlvd.)	lb.	.33¾	.34¾
S-2-A (dlvd.)	lb.	.31½	.32½
S-2-B (dlvd.)	lb.	.31	.32
Stearic Acid, Other			
Neo-Fat 1-60 (dlvd.)	lb.	.29	.30
Neo-Fat 1-65 (dlvd.)	lb.	.30	.31
Stearite	cwt.	36.00	38.00
White Lead Carbonate (dlvd.)	lb.	.19	.20
Zinc Laurate (c.l.)	lb.	—	.29
Laurex	lb.	.32	.35
Zinc Stearate	lb.	.51	.52
Aquazinc	lb.	.20	.35

Unclassified Activators

Actifat (dms.)	lb.	—	.18
Acidex	lb.	.09	.15
Aero Ac 50	lb.	.50	.56
165	lb.	.37	.39
Barak	lb.	—	.60
D-B-A	lb.	—	1.95
Delac J	lb.	.55	.60
P	lb.	.45	.52
Dibutylamine (l.c.l., dms.)	lb.	—	.53½
Dutch Boy Normasal	lb.	—	.43¼
Palmalene (drums)	lb.	—	.15
Plastolein 9050 (dms.)	lb.	.55¼	.57½
9055 (dms.)	lb.	.45¾	.48
9058 (dms.)	lb.	.55¼	.57½
9250 (dms.)	lb.	.35¼	.37½
9715 (dms.)	lb.	.41¾	.44
Polyac	lb.	—	1.40
Ridacto (drums)	lb.	.22	.24
Snodotte (dlvd.)	lb.	.22½	.23½
SOAC (min. 10 dms.)	cwt.	—	10.00
SOAC-KL (min. 10 dms.)	cwt.	—	10.00

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.02½	.02¾
National (cyl., dlvd.)	lb.	.16	.20
Aqua Ammonia (l.c.l., dms.)	lb.	.0285	.0325
M.B.M. (l.c.l.)	lb.	—	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	—	.12
Regular	lb.	—	.08½
D.C. Antifoam A	lb.	6.74	7.30

ANTI-OXIDANTS

Agerite Alba	lb.	2.20	2.30
Gel	lb.	.58	.60
Hipar	lb.	.82	.84
H. P.	lb.	.61	.63
Powder	lb.	.46	.48
Resin	lb.	.63	.65
Resin D	lb.	.46	.48
Stalite	lb.	.46	.48
White	lb.	1.40	1.50
Akroflex C	lb.	.58	.60
Aminox	lb.	.46	.55
Aranox	lb.	—	2.15
Benzoquinone	lb.	1.50	1.75
Betanox Special	lb.	.68	.77
B-L-E	lb.	.46	.55
Powder	lb.	.61	.63
B-X-A	lb.	.43	.45
Carvacrol	lb.	—	.85
Chlorcarvacrol	lb.	—	2.45
Eugenol C-95%	lb.	—	1.28
Flectol H	lb.	.46	.53
Flexamine	lb.	.61	.70
Gallic Acid, Tech.	lb.	1.10	1.23
USP or NF	lb.	1.27	1.40
Hydroquinone	lb.	.90	.90
Monomethylparaminophenol Sulfate	lb.	2.40	2.90
Neozone Standard	lb.	.66	.68
A	lb.	.43	.45
C	lb.	.47	.49
D	lb.	.43	.45

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Synvarite RC Resins

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2. Can also be used advantageously with Natural Rubber and Neoprene
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   - Mechanical Properties

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ANTI-OXIDANTS (Cont'd)

Oxidex	lb.	——	3.40
Parazone	lb.	——	.68
PDA-10	lb.	.36	.38
Perflectol	lb.	.61	.68
Permalux	lb.	1.53	1.55
Pyrogallic Acid, Resublimed.	lb.	2.60	2.65
USP Crystals	lb.	2.10	2.15
Resorcin, Tech. (dlvd.)	lb.	——	.64
Santoflex B	lb.	.46	.53
BX	lb.	.57	.64
Santovar-A	lb.	1.30	1.37
Santowhite (crystals)	lb.	1.65	1.72
Santowhite MK	lb.	1.40	1.52
MKS	lb.	1.25	1.37
S.C.R. (tons)	lb.	.32	.34
Solux	lb.	1.93	1.95
Stabilite (tons)	lb.	——	.46
Alba (tons)	lb.	——	.69
L (tons)	lb.	——	.48
Stabilizer No. 1	lb.	——	1.65
Stabilizer No. 320	lb.	——	.80
Tannic Acid, Tech.	lb.	.70	.79
Thermoflex	lb.	1.48	1.50
A	lb.	.76	.78
C	lb.	.54	.56
Thymol	lb.	——	2.50
V-G-B	lb.	.55	.64

ANTI-SCORCHING AGENTS

Good-rite Vultrol	lb.	.55	.57
Retarder PD	lb.	——	.36
Retarder W	lb.	——	.43
Sodium Acetate 60-62% Crystals	lb.	——	.05½

ANTISEPTICS AND GERMICIDES

Formaldehyde (barrels)	lb.	——	.062
G-4 (bbls.)	lb.	1.00	1.15
G-11	lb.	——	3.50
Methyl Para Hydroxy Benzoate	lb.	——	2.10
Nuodex 100 S.S. (dlvd.)	lb.	——	1.05
Nuodex 100 W.D. (dlvd.)	lb.	——	1.20
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	——	.2125
Ortho Cresol (26°-27°)	lb.	——	.18
Soligen Drier—Copper 8% (drums)	lb.	——	.22½
Zinc 8% (dms.)	lb.	——	.21¼
Vancide	lb.	——	.80

AROMATICS (DEODORANTS)

Bouquet 149	lb.	——	3.00
Coumarin	lb.	——	2.75
Curodex 19	lb.	——	4.75
188	lb.	——	5.75
198	lb.	——	6.75
D-6 Masking Perfume	lb.	——	1.35
Deodorant 65	lb.	——	1.00
Deodorant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
Latex Perfume 5	lb.	——	3.25
6	lb.	——	7.50
9	lb.	——	.65
Neutroleum Delta	lb.	——	2.40
Gamma	lb.	——	3.40
Parador A	lb.	——	2.25
C	lb.	——	3.25
E	lb.	——	.55
F	lb.	——	.47
I	lb.	——	2.00
K	lb.	——	.43
GD 5280	lb.	——	2.50
GD 5348	lb.	1.90	3.25
Perfume Oil Bouquet Vanilla M	lb.	2.40	2.75
Rodo No. 0	lb.	4.00	4.50
No. 10	lb.	5.00	5.50
Rubbarome (dms.)	lb.	1.10	2.10
Rubber Perfume 12	lb.	——	1.90
Russian Leather 7	lb.	——	4.10
Vanillin	lb.	3.00	3.15

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.0640	.0975
Blowing Agent CP-975	lb.	——	.50
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	1.85
Sponge Paste	lb.	——	.20
Unicel	lb.	——	.60
ND	lb.	——	1.00
Urea	lb.	.0425	.0475

BONDING AGENTS

Durez 12987	lb.	.48	.53
Interlake Resin No. 4162	lb.	——	1.50
MDi	lb.	7.25	7.75
50	lb.	3.60	3.85
Pliobond 20	gal.	2.75	4.00
30	gal.	3.45	4.70
Reanite	gal.	6.75	7.25
Rex Compound 482	gal.	——	1.05
Ty-Ply Q (and S)	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	8.11	8.61
Glacial—99½% (bbls.)	cwt.	14.05	14.55
Calcium Nitrate, Tech., Crystals	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	——	.084
Zinc Nitrate, Tech.	lb.	——	.21½

COLORING AGENTS

Black

Carbon Black—See *Reinforcing Agents*			
Aquablak B (also M, R)	lb.	.08¼	.09¼
Aquablak S	lb.	.07¾	.08¾
Black Shield 4-35 (dms.)	lb.	——	.0825
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)	lb.	.0975	.1000
Raven Black Pure Iron Oxide	cwt.	10.75	11.00

Blue

Blue GD, Dispersed	lb.	——	3.95
Paste	lb.	——	1.80
Blue N	lb.	——	.94½
Blue YD, Dispersed	lb.	——	2.50
Milori Blue 11840 (dlvd.)	lb.	——	.45
Monastral Fast Blue CP.	lb.	——	3.85
PCD, Dispersed	lb.	——	2.50
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	——	1.00
Stan-Tone Blue	lb.	1.40	4.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	1.00	2.45
Victoria Blue BP-262-D	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	.1075	.12
Mapico Brown (50 lb. bags)	lb.	——	.1250

Green

Filo Green D-700 (and D-705)	lb.	——	.30
Green Chromium Oxide, Pure	cwt.	33.00	40.00
Green Chromium Oxide, Pure, Hydrated	cwt.	75.00	100.00
Green FD, Dispersed	lb.	——	1.50
Monastral Fast Green GSD, Dispersed	lb.	——	3.20
GSD Paste	lb.	——	1.10
Permansa Green CP-594	lb.	——	1.35
Pigment Green B	lb.	——	1.35
GL-652D	lb.	.88	.93
Ramapo Green	lb.	——	4.00
Rubber Green X-1292	lb.	——	1.00
Stan-Tone Green	lb.	1.50	3.30
Utility Green	lb.	——	.30
Vansul Green M.B.	lb.	.85	2.40

Maroon

Stan-Tone Maroon	lb.	3.00	3.05
Vansul Maroon M.B.	lb.	1.05	2.80

Orange

Molybdate Orange	lb.	——	.45
Orange F	lb.	——	3.65
FD, Dispersed	lb.	——	2.75
Rubber Orange X-2065	lb.	——	2.60
Stan-Tone Orange	lb.	1.65	2.25
Vansul Orange M.B.	lb.	2.15	2.65

Red

Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.10	1.35
Graphic Red (dlvd.)	lb.	——	.80
Indian Red, Pure	cwt.	11.50	11.75
Mapico Red 297 (50 lb. bags)	lb.	.1050	.1075
Oximony Iron Oxide	lb.	——	.09
Red Iron Oxide, Light	cwt.	11.50	11.75
Red PB	lb.	——	1.90
PBD Dispersed	lb.	——	1.65
2B	lb.	——	1.75
2BD, Dispersed	lb.	——	1.65
Rubanox Red CP-762 (dlvd.)	lb.	——	1.30
Rubber Red CP-339 (dlvd.)	lb.	——	1.05
Rubber Red RT-364	lb.	——	.75
Rubber Red RT-425	lb.	——	.75
Rubber Red X-1148	lb.	——	.80
Solfast Red CP-663 (dlvd.)	lb.	——	1.80
CP-787 (dlvd.)	lb.	——	1.30
Stan-Tone Red	lb.	1.10	3.05
Vansul Red M.B.	lb.	1.00	2.05
Watchung Red	lb.	——	1.90

White—Lithopone

Albalith	lb.	.06⅜	.06⅝
Astrolith	lb.	.06⅜	.06¾
Cryptone No. 19	lb.	.08¼	.08½
CB No. 21	lb.	.08	.08¼
Eagle	lb.	.06⅜	.06⅝
Permalith	lb.	.06	.06¼
Ponolith	lb.	.06⅜	.06¾
Sunolith	lb.	.06⅜	.06¾

White—Titanium Pigments

Rayox	lb.	.17½	.20½
Ti-Cal	lb.	.07¾	.08¼
Ti-Pure	lb.	.21½	.22½
Titanox A—all grades (dlvd.)	lb.	.17½	.18
B-30 (dlvd.)	lb.	.07	.07½
C (dlvd.)	lb.	.06¾	.07¼
RA—all grades (dlvd.)	lb.	.17½	.20
RC-HT (dlvd.)	lb.	.06¾	.07¼
Zopaque	lb.	.17½	.18½

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 33, 44, 55)	lb.	.1350	.1375
Eagle	lb.	.1350	.1375
Horse Head Special	lb.	.1350	.1375
XX Red	lb.	.1350	.1375
Joxite	lb.	.1150	.1200
St. Joe Black Label.	lb.	.1350	.1375
Green Label	lb.	.1350	.1375
Red Label	lb.	.1350	.1375

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1575	.1600
Eagle Green Seal	lb.	.1525	.1550
Eagle Red Seal	lb.	.1475	.1500
Eagle White Seal	lb.	.1575	.1600
Florence Green Seal	lb.	.1525	.1550
Red Seal	lb.	.1525	.1550
White Seal	lb.	.1575	.16
Kadox 25	lb.	.1575	.16
Kadox 15, 17 and 72	lb.	.1350	.1375
U. S. P. 12	lb.	.1675	.17

White—Zinc Sulfide

Cryptone ZS-800	lb.	.1350	.1375

Yellow

Anchor Brand Pure Iron Oxide	cwt.	9.00	9.25
Cadmolith Yellow (bbls.)	lb.	——	.85
Chrome Yellow	lb.	——	.34
Chrome Yellow 12310	lb.	——	.2950
Ferrox	cwt.	7.50	8.50
Mapico Yellow (50 lb. bags)	lb.	.0825	.0850
Rubber Yellow X-1940	lb.	——	1.60
Stan-Tone Yellow	lb.	1.20	1.75
Toluidine Yellow	lb.	——	1.70
YL-556-D	lb.	——	.82
Oximony Iron Oxide	lb.	——	.06¾
Vansul Yellow M.B.	lb.	.85	1.00
Yellow G	lb.	——	1.95
GD, Dispersed	lb.	——	1.85
HN	lb.	——	1.60
Zinc Yellow	lb.	——	.245

DISPERSING AGENTS

Agchem SA-19	lb.	——	.30
SA-20	lb.	——	.70
Aqualsol-AR 90%	lb.	——	.24¾
Beaconol 52	lb.	.60	.75
Darvan No. 1 (and No. 2)	lb.	.21	.30
Daxad 11 (21, 23)	lb.	.08	.35
Dilex	lb.	——	.32
Dispersaid	lb.	1.25	1.35
Halloid	lb.	.03¾	.09½
HornKem No. 1	gal.	——	1.60
No. 3G	gal.	——	1.75
No. 12	lb.	——	.17
Lomar PW	lb.	.18	.19
Marasperse CB	lb.	.11½	.15
N	lb.	.09	.10
Rubbex	lb.	——	.27½
Stan-Chem BQC	lb.	.12¼	.17¼
1067	lb.	——	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¼
Triethanolamine (drums) (dlvd.)	lb.	.21½	.22½
Triton R-100	lb.	.15½	.25
Yelkin TT	lb.	——	.22
Zinsper	lb.	——	.15

EXTENDERS

Advagum 1098	lb.	——	.65
Bunaweld Polymer No. 780.	lb.	——	.22
No. 5514	lb.	——	.30
D-92 (and D-93) (dms.)	lb.	——	.12
Extender 600	lb.	——	.208
PR-162 Latex (dms.)	gal.	1.00	1.60
Synprolac	lb.	——	.19
Synprowax	lb.	.16	.19
Vistanex	lb.	——	.32

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.15	.95
Lionite	lb.	.09¾	.90
Pumice	lb.	.03	.05
Aluminum Hydrate	lb.	——	.17
Aluminum Silicate			
Silical	ton	37.00	55.00
Marter White	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	77.00	85.00
Barytes			
No. 1 Floated, White	ton	33.10	44.55
No. 2 Floated, Unbleached	ton	31.10	41.95
No. 22 Barytes (c.l.)	ton	——	18.37
Foam A	ton	——	33.10
Bentonite (c.l.)	ton	——	11.00
SPV Volclay (c.l.)	ton	——	11.00

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FILLERS (Cont'd)

Blanc Fixe	ton	72.50	-120.00
Calcium Carbonate			
Atomite (c.l.)	ton	——	- 30.00
B.I. White No. 1 (c.l.)	ton	——	- 7.50
B.I. White No. 2 (c.l.)	ton	——	- 7.00
Blue-Star XX	ton	——	- 15.00
Calcene T	ton	45.00	- 55.00
Camelwite	ton	——	- 30.00
Kalite (c.l.)	ton	——	- 40.00
Lesamite (c.l.)	ton	——	- 27.50
Lim-Cal (c.l.)	ton	——	- 12.50
Millical (c.l.)	ton	——	- 25.00
Multifex	ton	——	-105.00
Sierracal	ton	15.00	- 18.50
Super Multifex	ton	——	-145.00
Suspenso (c.l.)	ton	——	- 22.00
Swansdown (c.l.)	ton	——	- 20.00
Witcarb R (c.l.)	ton	——	-105.00
R-12 (c.l.)	ton	40.00	- 60.00
Calcium Silicate			
Silene EF	ton	110.00	-120.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	——	- 18.00
Calcium Sulfate, Hydrous			
Crysta-Cal (c.l.)	ton	——	- 12.50
Terra Alba No. 1	ton	12.00	- 14.40
Chalk Whiting (l.c.l.)	lb.	.0150	- .0175
Recco Paris Whiting	ton	——	- 27.00
Clay			
Alsite (c.l.)	ton	——	- 13.00
Aluminum Flake	ton	16.50	- 60.00
A.S.P. No. 1 (c.l.)	ton	——	- 35.00
No. 11 (c.l.)	ton	——	- 40.00
Buca (c.l.)	ton	——	- 44.00
Catalpo (c.l.)	ton	——	- 33.00
Champion	ton	——	- 13.00
C.S.D. (c.l.)	ton	——	- 12.00
Crown	ton	——	- 13.00
Dixie (c.l.)	ton	——	- 13.00
Hi-White R	ton	——	- 15.00
Hydratex R	ton	28.00	- 45.00
Kaolloid Clay (c.l.)	ton	——	- 10.50
Markham (c.l.)	ton	——	- 13.00
McNamee (c.l.)	ton	——	- 12.50
Oldham (c.l.)	ton	——	- 13.00
Paragon	ton	12.50	- 30.50
Recco (c.l.)	ton	——	- 13.00
Stellar-R	ton	——	- 50.00
Suprex	ton	13.00	- 31.00
Upton	ton	19.50	- 21.00
Whitetex (c.l.)	ton	——	- 50.00
Witco No. 1 (c.l.)	ton	13.00	- 33.00
No. 2 (c.l.)	ton	13.00	- 33.00
Diatomaceous Earth	ton	30.00	- 50.00
Kaylorite (c.l.)	ton	——	- 30.00
Dolomite (c.l.)	ton	11.00	- 12.00
Flock			
Cotton	lb.	.08½	- .20
Filfloc F 40-9000	lb.	——	- .16
Filfloc F 6000	lb.	——	- .22
Rayon, bleached or dyed	lb.	.85	- 1.50
Rayon, grey	lb.	——	- .18
Solka-Floc (l.c.l.)	lb.	.05	- .15
Wool, bleached or dyed	lb.	.70	- 1.00
Glue, Bone (dlvd.)	lb.	.16½	- .18½
Graphite	lb.	.05	- .20
Ground Glass (l.c.l.)	lb.	.04	- .06
Leather, Shredded	lb.	.05	- .17
Lignin	lb.	.03	- .06
Indulin	lb.	——	- .09
Limestone, Pulverized	ton	3.25	- 10.00
Micro Velva	ton	45.00	- 47.00
Velvet Filler, Regular	ton	20.00	- 22.00
Magnesium Carbonate	lb.	.09	- .10
Clearcarb	lb.	.10¾	- .11¼
K & M	lb.	.1175	- .1225
Magnesium Oxide	lb.	.05	- .06
Magnesium Silicate	ton	18.00	- 35.00
Airex	ton	22.50	- 23.50
Asbestol	ton	20.00	- 22.00
Blue Star Talc	ton	——	- 23.00
L.S. Silver	ton	24.50	- 26.50
Sierra White	ton	21.25	- 23.25
Mica	lb.	.01¾	- .07¾
Concord	lb.	.0675	- .0750
Micro-Mica	lb.	.06¾	- .07½
Mineralite (c.l.)	ton	30.00	- 40.00
Silversheen	lb.	.06¾	- .07½
Triple A Mica (c.l.)	ton	——	- 25.00
Wet Ground Biotite Mica	lb.	.05½	- .06¼
Wet Ground Mica No. 160	lb.	.06¾	- .07½
Mineral Black			
Keystone 126	ton	——	- 13.00
Pyrophyllite			
Pyrax A (c.l.)	ton	——	- 12.50
WA (c.l.)	ton	——	- 14.00
Silica	ton	16.00	- 27.00
Blue Star	ton	——	- 21.50
Slate, Powdered (l.c.l.)	ton	15.00	- 20.00
Talc, Domestic	ton	9.00	- 20.00
Walnut Shell Flour	ton	38.00	- 80.00
Whiting, Commercial	ton	8.00	- 20.00
Cameline (c.l.)	ton	8.50	- 10.00
C-C-O White	ton	——	- 16.00
Keystone (c.l.)	ton	——	- 16.00
Rambo No. 1 White	ton	——	- 9.00
Snowflake (c.l.)	ton	——	- 18.00
Veroc (c.l.)	ton	——	- 8.50
Welco (c.l.)	ton	——	- 8.50
York White (c.l.)	ton	——	- 9.00
Wood Flour	ton	20.00	- 62.18

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	1.05	- 1.35
Black Out	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.65	- .85
VanWax	gal.	1.25	- 1.30

FLAME RETARDANTS

Celluflex 179C (dms.)	lb.	——	- .39
Chlorinated Paraffin	lb.	.10	- .25
Halowax	lb.	.22	- .37
Zinc Borate 3167	lb.	.12	- .16¾
Zyrox	lb.	.65	- .79

LUBRICANTS, MOLD

Aquadag	lb.	3.15	- 3.45
Aquarex BBX Conc.	lb.	——	- .78
D	lb.	——	- .76
L Paste	lb.	——	- .85
MDL Paste	lb.	——	- .30
Borax, Granular (l.c.l.)	ton	70.00	- 80.00
Colite Concentrate (dms.)	gal.	——	- .90
Concentrex	lb.	——	- .20
D.C. Emulsion No. 35	lb.	2.20	- 3.50
D.C. Mold Release Fluid	lb.	5.20	- 6.00
Dipex	lb.	.14	- .18
Dri-Lube	lb.	——	- .18
Erlen Mold Lubricant	gal.	1.25	- 1.50
Glycerized Lubricant	gal.	——	- 1.85
Glydag	lb.	1.30	- 2.00
Kokobace	lb.	——	- .12
Latex-Lube (dlvd.)	lb.	——	- .22¾
Liqui-Lube (dlvd.)	lb.	——	- .16¾
Lubrex	lb.	.25	- .30
Migralube	lb.	——	- .30
Moldeze No. 1	gal.	——	- 36.00
No. 3	gal.	——	- 7.50
Mold Lubricant No. 72 Conc.	gal.	1.26	- 2.75
Mold-Slick	lb.	.202	- .215
Orvus WA Paste (dms.)	lb.	——	- .25
Prodag	lb.	.25	- .38
Redotex Flakes (dlvd.)	lb.	.18⅞	- .19½
Powder (dlvd.)	lb.	.19⅜	- .20
Rubber-Flo	gal.	——	- 1.15
Rubber-Glo	gal.	——	- .94
Rusco Mold Paste	lb.	——	- .18
Sericite (l.c.l.)	ton	65.00	- 75.00
Thermalube	lb.	——	- .11
Ulco Mold Soap	lb.	.16	- .29
Werkrite Flakes (dlvd.)	lb.	.15⅜	- .16
Powder (dlvd.)	lb.	.16⅜	- .17

LUBRICANTS, RUBBER

Propylene Stearate (drums)	lb.	——	- .40
Rubberol	lb.	——	- .3150

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.48	- .49
Calcium Stearate	lb.	.45	- .47
Polyethylene Glycol	lb.	.25	- .26
Rexanol A	lb.	——	- .11
Separex A	lb.	——	- .15
Zinc Stearate	lb.	.48	- .49

MOLD CLEANERS

Actusol (dlvd.)	gal.	——	- 1.45
Metso 99	cwt.	3.05	- 4.45
Granular	cwt.	2.50	- 3.55
Rubber-Sol	gal.	——	- 2.75
Shelblast	ton	80.00	-140.00
Sodium Silicate	cwt.	.80	- 1.40
Sprex A.C. (dlvd.)	lb.	——	- .15½

PEPTIZING AGENTS

Peptizer P-12	lb.	.84	- .90

PLASTICIZERS & SOFTENERS

AA (drums)	lb.	——	- .23
Acto 500	lb.	——	- .09
Adipol BCA (dms.)	lb.	.44½	- .45
Amalgamator Z-4	lb.	——	- .30
American Pine Tar	gal.	.34½	- .45½
Arolene 1980 (c.l.)	lb.	——	- .10
2286	lb.	——	- .25
2553 (c.l., dms.)	lb.	——	- .13
Bardol	lb.	.02¾	- .03¾
B	lb.	.05½	- .05¾
Bayol D	gal.	.29½	- .31½
F	gal.	.46	- .49
Beeswax, Refined & Bleached	lb.	.64	- .74
Yellow Refined	lb.	.63½	- .68
Bondogen	lb.	.55	- .60
B.R.C. No. 20	lb.	.0125	- .0135
B.R.H. 2	lb.	.02	- .029
BRS 700	lb.	.0175	- .026
B.R.T. 3	lb.	.024	- .025
4	lb.	.0225	- .0235
7	lb.	.0265	- .0275
B.R.V.	lb.	.0325	- .04
Bunarex Resins	lb.	.06	- .0750
Bunatak M	lb.	——	- .20
O	lb.	——	- .18
R	lb.	——	- .14
U	lb.	——	- .15
No. 21	lb.	——	- .08
No. 90	lb.	——	- .08
No. 865	lb.	——	- .17
No. 1080	lb.	——	- .09½

PLASTICIZERS & SOFTENERS (Cont'd)

Burgundy Pitch	lb.	.1026	- .1050
Butac	lb.	.11	- .12
Butyl Benzyl Sebacate	lb.	——	- .67
Butyl Carbitol Perlargonate (dms.)	lb.	——	- .645
Butyl Cellosolve Perlargonate (dms.)	lb.	——	- .68
Butyl Palmitate	lb.	——	- .26½
Butyl Roleate	lb.	.176	- .18
Butyl Stearate	lb.	——	- .465
BWH-1	lb.	——	- .14
Califlux 510, 550	lb.	.025	- .0325
G.P.	lb.	.0125	- .02
R-100	lb.	.05	- .0575
Campol (t.c.)	ton	——	- 42.00
Candelilla Wax Prime	lb.	.67	- .75
Capryl Benzyl Sebacate	lb.	——	- .68
Carbonex	lb.	.0325	- .0375
S Flakes	lb.	.0475	- .0525
S Plastic	lb.	.046	- .051
644	lb.	.0375	- .04
Carbowax 4000 (drums)	lb.	.31	- .32
Cardolite 615	lb.	.37	- .40
816	lb.	.25½	- .28½
5858	lb.	.42	- .46
Carnauba Wax, Crude	lb.	.70	- .75
Refined	lb.	.85	- .90
Substitute	lb.	.45	- 1.08
Yellow	lb.	1.20	- 1.25
Celluflex	lb.	.41½	- .43
Ceresine Wax	lb.	.15	- .20
Contogum	lb.	.06¾	- .10¼
Cumar Resins	lb.	.05½	- .14½
D.B.M.	lb.	——	- .30
Degras, Common	lb.	.10	- .14
Diamylphenol (l.c.l., dms.)	lb.	——	- .28
Dibenzyl Sebacate	lb.	——	- .76
Dibutoxethyl Sebacate	lb.	——	- .625
Dibutyl Phthalate	lb.	.36	- .385
Dibutyl Sebacate—Tech.	lb.	——	- .67
C.P.	lb.	——	- .69
Dicapryl Adipate	lb.	——	- .40
Dicapryl Phthalate	lb.	——	- .45
Dicapryl Sebacate	lb.	——	- .645
Di-Carbitol Phthalate (dms.)	lb.	.39½	- .40
Dicyclohexyl Phthalate	lb.	——	- .43
Dielex	lb.	.0625	- .0650
Diethyl Phthalate (t.c.)	lb.	.31½	- .38½
Dihexyl Adipate	lb.	——	- .36
Dihexyl Phthalate	lb.	——	- .35
Dihexyl Sebacate	lb.	——	- .49
Di Isobutyl Azelate (dms.)	lb.	——	- .715
Dimethyl Phthalate	lb.	——	- .28
Dimethyl Sebacate	lb.	——	- .715
Dinopol (dms.)	lb.	.50½	- .51
Dioctyl Phthalate (dms.)	lb.	.43½	- .44
Dipolymer Oil	gal.	.33	- .38
Dispersing Oil No. 10	lb.	.0525	- .055
Dutrex A (B, 5, 6)	lb.	.02½	- .03¼
15	gal.	.10	- .189
20, 21, 25	lb.	——	- .03
ELA	lb.	——	- .80
Estac	lb.	——	- .16
Ethox (dms.)	lb.	.4250	- .43
Flexol DOP	lb.	——	- .433
TOF	lb.	——	- .475
3GH	lb.	——	- .475
3GO	lb.	——	- .53
4GO	lb.	——	- .435
G. B. Light Process Oil	lb.	.025	- .0325
H-70	lb.	.56¾	- .64½
Hercoyln (dlvd.)	lb.	.1675	- .1725
Herron-H.T.	gal.	.2400	- .2700
Herron-Plas	lb.	.0350	- .0375
Herron-Wax	lb.	.0500	- .0550
HT-300	lb.	.45¾	- .53
Indonex 632½ (633½, 634½, 638½)	gal.	.1200	- .1700
VG (dlvd.)	lb.	——	- .07
Indopol H-300 (bbls.)	gal.	1.28	- 1.32
IMH	lb.	——	- .65
KP 23 (dms.)	lb.	.49½	- .50
KP 23 (dms.)	lb.	.49½	- .50
70 (dms.)	lb.	.41½	- .42
120 (dms.)	lb.	.44½	- .45
140 (dms.)	lb.	.49½	- .50
150 (dms.)	lb.	.44½	- .45
Kronisol (drums)	lb.	.40	- .40½
Kronitex (drums)	lb.	.37½	- .38
Lanolin, Tech. Anhydrous	lb.	——	- .19
Lead Oleate	lb.	.16½	- .42
Lindol	lb.	.41½	- .43½
2-Mercaptoethanol (drums)	lb.	——	- .75
Methox (dms.)	lb.	.41	- .41½
Methyl Oleate	lb.	——	- .20
Methyl Stearate	lb.	——	- .70
Monoplex DBS	lb.	.90	- .91
Monoplex DOS	lb.	.84	- .85
5 (dms.)	lb.	.98	- 1.00
11 (dms.)	lb.	.50	- .51
16 (dms.)	lb.	.45	- .46
Montan Substitute No. 506	lb.	.425	- .435
Montan Wax, Crude	lb.	.50	- .55
Monten Wax (c.l.)	lb.	.52	- .55
Monty Wax	lb.	——	- .35
Natac	lb.	.1050	- .1150
Neolene 210 (t.c.)	lb.	——	- .16
212 (t.c.)	lb.	——	- .14
220 (t.c.)	lb.	——	- .15
Nerium	lb.	——	- .09
Nevillac Resins (dms.)	lb.	.23	- .45
Neville Resins (dms.)	lb.	.10	- .15½
Nevindene Resins (dms.)	lb.	.12½	- .15½
Nevinol (dms.)	lb.	——	- .17

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PLASTICIZERS & SOFTENERS (Cont'd)

Nevoll	lb.	.0325	.0425
Nevtex 10 (dms.)	lb.	—	.10½
Nuba 1 (and 2) (dms.)	lb.	—	.04
3X (dms.)	lb.	—	.065
15 (and 30) Oil (dms.)	lb.	—	.25
781 Oil (dms.)	lb.	—	.28½
No. 480 Oil Proof Resin	lb.	—	.15
Ohopex Q10 (dms.)	lb.	.435	.44
Opalwax	lb.	.37	.38
Ortho-Nitrobiphenyl	lb.	.06	.11
Ozokerite Wax No. 64 White	lb.	.31	.32
Yellow	lb.	.25	.26
P-1 (and 4, 6, 8, 20)	lb.	.30	.35
P-75	lb.	.66	.72
Pale 4 (and 1000)	lb.	—	.25
Palm Oil	lb.	—	.11
Paradene Resins (dms.)	lb.	.065	.075
Para Flux (dms.)	gal.	.1875	.1975
2016 (l.c.l.)	gal.	.22	.23
Para Lube (l.c.l.)	lb.	.046	.048
Paraplex G-25	lb.	.90	.91
G-40	lb.	.48¾	.49¾
Parmo	lb.	.06	.13½
Pentalene 90 (l.c.l., dms.)	lb.	—	.245
92 (l.c.l., drums)	lb.	—	.26
Pentaphen No. 114 (l.c.l., bags)	lb.	—	.27
Pepton 22	lb.	.72	.75
PG-16 (drums)	lb.	—	.34
Philplast No. 1	gal.	.18	.35
No. 2	gal.	.13	.35
Picco 10 (and 25)	lb.	—	.12
75 (and 100)	lb.	—	.11½
S.O.S.	gal.	.29	.34
Piccocizer 30	lb.	.05½	.06
Piccolastic A (and B, C, D, E)	lb.	.22	.22½
F	lb.	.139	.144
Piccolyte S Resins	lb.	.1500	.1575
Piccoumaron Resins	lb.	.06½	.14½
Piccovar	lb.	.12	.12½
Piccovol	lb.	.02½	.04
Pictar	gal.	.25	.30
Plas-Blend 360	lb.	.03	.04
Plastac M	lb.	—	.09¼
Plasticizer No. 50B	lb.	.365	.385
Plasticizer FP-6	lb.	—	.65
Plasticizer SC	lb.	.50	.52
Plasticizer VA-1	lb.	—	.40
Plasticizer XP-3	lb.	—	.50
Plastoflex 50	lb.	—	.38
J-21	lb.	—	.41
Plastogen	lb.	.07¾	.08
Plastolein X-55 (dms.)	lb.	—	.60
X-148 (dms.)	lb.	—	.70
Plastone	lb.	.27	.30
Polymel D	lb.	—	.20
Polymel Liquid	gal.	.12	.17
Polymel Resins	lb.	.029	.05
Process Oil C-255	gal.	—	.22
PT 400 Pine tar (600, 800) (t.c., dms.)	gal.	.34½	.45½
Refrigerator Oil 145-R	gal.	—	1.25
Reogen	lb.	.11¾	.12
465 Resin (drums)	lb.	—	.0575
Resin 731	lb.	—	.13¾
Resin C	lb.	.02	.0275
Resinex	lb.	.03¼	.04
L-4	lb.	.02¼	.03
Ridbo 369 (drums)	lb.	.08	.09
369-F (drums)	lb.	—	.12
Rosin Oil	gal.	.54	1.20
R.P.A. No. 2	lb.	—	.65
No. 3	lb.	—	.46
No. 5	lb.	—	.57
R.S.O. Softening Oil	lb.	.03	.05
Rubtar	gal.	—	.40
Santicizer B-16	lb.	.50	.57
E-15	lb.	.47	.54
M-17	lb.	.44	.51
No. 140	lb.	.31	.38
Softener No. 20	gal.	.09	.25
S.P.C.	lb.	—	.19½
Stanolind Petrolatum	lb.	.037	.081
Wax	lb.	.25	.30
Staybelite Resin (dms.)	lb.	—	.11
Sunny South Burgundy Pitch	cwt.	10.51	10.75
Sunny South Pine Tar	gal.	.34½	.45½
Sunny South Rosin Oil	gal.	.50	.67¾
Superla Wax	lb.	.25	.30
Syncera Wax	lb.	.175	.225
Synplasticizer	lb.	—	.10
Syn Tac (c.l.)	gal.	—	.33
Synthol	lb.	—	.2550
Tar, Refined	gal.	.12	.17
K-Tarnel NR (t.c.)	lb.	—	.0851
Terpene A	gal.	—	.65
TP-90B (and TP-95)	lb.	.55	.65
TP98	lb.	—	.50
Triacetin	lb.	.34	.45
Tricresyl Phosphate	lb.	.31	.33½
Turgum S	lb.	.09½	.10½
Vandiset A	gal.	.13	.20
Vanadiset B, C, D	lb.	.021	.055
Pulverized	lb.	.08½	.31
Solution	gal.	.40	.65
Vistac No. 1	gal.	—	1.32
No. 2	gal.	—	1.66
No. 4	gal.	—	1.80
Witresin—Granular	ton	41.00	43.00
Solid	ton	36.00	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	—	.17¼
Refined (drums)	lb.	—	.15¾
Castorwax (min. 400 lbs.)	lb.	—	.34
Dutrex 7	lb.	.02½	.03¾
30	gal.	.24	.27
ELA (dlvd.)	lb.	—	.80
Heron S.P.O.	lb.	.22	.23
Resin No. 510	lb.	.13½	.16½

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾	.21
Agchem SA-9 (to SA-12)	lb.	.65	1.02
Alpha Protein	lb.	.28	.32
Aroostoocrat	lb.	—	.07½
Carob Bean Flour	lb.	.42	.50
Casein	lb.	.29	.37
Ethylene Diamine 68%	lb.	.57	.58
Karaya Gum	lb.	.20	.50
Prosein	lb.	.071	.09
Rex Compound No. 2801	lb.	—	.15
Sodium Alginate	lb.	—	1.50
Stablex B	lb.	—	.95
Tragacanth Flakes	lb.	.60	1.35

RECLAIMING AGENTS

1-D Heavy Oil (drums)	lb.	.0450	.0550
No. 517 H.B. Oil	gal.	.11½	.16½
535	gal.	.22	.27
C-6 Oil (and 28, 32)	gal.	.33	.38
C-10 Oil	gal.	.25	.30
C-33 Oil	gal.	.20	.25
Caustic Soda—Flake 76% (c.l., drums)	cwt.	—	3.25
Liquid 50% (t.c.)	cwt.	—	2.25
Solid 76% (c.l., dms.)	cwt.	2.50	2.85
Cresylic Acid (99-100%)	gal.	1.55	1.69
D-4	gal.	.23	.28
E-5	gal.	.21	.26
G. B. Reclaiming Oil	gal.	.12	.18
Heavy Aromatic Naphtha (t.c.)	gal.	—	8.25
LX-77 Reclaiming Solvent	gal.	.15	.21
LX-572 Reclaiming Oil	gal.	.23	.28
PT 67 Light pine oil	gal.	.60	.70
PT 101 Pine tar oil	gal.	.32	.43
PT 150 Pine solvent	gal.	.44	.45
Q Oil	gal.	.246	.296
Reclaiming Oil 1621	lb.	.03	.04
Reclaiming Oil 3186	gal.	—	.295
Reclaiming Oil 3186-G	gal.	—	.28
Reclaiming Reagent No. 4	lb.	.12	.15
Reclaiming Resin No. 1	gal.	.15	.35
R.P.A. No. 3 (dlvd.)	lb.	—	.46
Soda Ash (c.l., bags)	cwt.	—	1.20
Solvent 534	gal.	.22	.27
Solvent Oil 21	gal.	.24	.29
C-42	gal.	.27	.32
X-1 Resinous Oil	lb.	.0175	.0250
X-60 Solvent	gal.	.24	.32

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0732	.1175
Continental F	lb.	.0732	.1125
Croflex	lb.	.0732	.1125
Crow	lb.	.0732	.1125
Dixiedensed (and S)	lb.	.0732	.1125
Kosmobile (andS)	lb.	.0732	.1125
Kosmos T	lb.	.0732	.1125
Micronex HPC	lb.	.0732	.1125
Spheron 4	lb.	.0732	.1170
Witco Disperso No. 6	lb.	.0732	.1125

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0732	.1175
Continental A	lb.	.0732	.1125
Croflex TH	lb.	.0732	.1125
Dixie R-1	lb.	.0732	.1125
Dixiedensed HM (and S-66)	lb.	.0732	.1125
Huber Arrow TX	lb.	.0732	.1150
Kosmobile HM (and S-66, SMG)	lb.	.0732	.1125
Kosmos M	lb.	.0732	.1125
Micronex Standard	lb.	.0732	.1125
Spheron 6	lb.	.0732	.1170
Texas M	lb.	.0732	.1125
Witco Disperso No. 1	lb.	.0732	.1125

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0732	.1175
Continental AA	lb.	.0732	.1125
Croflex 77	lb.	.0732	.1125
Dixiedensed 77	lb.	.0732	.1125
Kosmobile 77	lb.	.0732	.1125
Micronex W-6	lb.	.0732	.1125
Spheron 9	lb.	.0732	.1170
Texas E	lb.	.0732	.1125
Witco Disperso No. 12	lb.	.0732	.1125
Wyex	lb.	.0732	.1150

Channel, Conductive (CC) (bags)

Dixie 5 dustless	lb.	.0732	.1125
Kosmink dustless	lb.	.0732	.1125
Spheron C	lb.	.1200	.1600
Spheron I	lb.	.1000	.1400
Spheron N	lb.	.2200	.2500
Voltex	lb.	.1500	.1850

Furnace, Fast Extruding (FEF) (bags)

Statex M	lb.	.0550	.0950

Furnace, High Modulus (HMF) (bags)

Continex HMF	lb.	.0500	.0900
Dixie 40	lb.	.0500	.0900
50	lb.	.0550	.0950
Kosmos 40	lb.	.0500	.0900
50	lb.	.0550	.0950
Modulex	lb.	.0500	.0900
Philblack A	lb.	.0550	.0950
Statex 93	lb.	.0500	.0900
Sterling L	lb.	.0500	.0900
Sterling SO	lb.	.0550	.0950

Furnace, Reinforcing (RF) (bags)

Kosmos 60	lb.	.0732	.1150

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0350	.0750
Dixie 20	lb.	.0350	.0750
Essex	lb.	.0350	.0750
Furnex	lb.	.0350	.0750
Gastex	lb.	.0350	.0750
Kosmos 20	lb.	.0350	.0750
Pelletex	lb.	.0350	.0750
Seminex	lb.	.0350	.0750
Sterling NS	lb.	.0350	.0750
Sterling R	lb.	.0350	.0750
Sterling S	lb.	.0350	.0750

Furnace, Fine (FF) (bags)

Statex B	lb.	.0575	.0975
Sterling 99	lb.	.0650	.1050

Furnace, High Abrasion (HAF) (bags)

Philblack O	lb.	.0732	.1132
Vulcan	lb.	.0732	.1170

Furnace, Very Fine (VFF) (bags)

Statex K	lb.	.0732	.1125
Sterling 105	lb.	.0732	.1170

Thermal, Fine (FT) bags)

P-33	lb.	—	.0500

Thermal, Medium (MT) (bags)

Thermax (c.l.)	lb.	—	.0300

REINFORCING AGENTS—MISCELLANEOUS

Darex Copoylmer No. 3 (and X34)	lb.	.35	.37
No. X43	lb.	.36	.38
Darex Copolymer Latex No. 3 (and X34)	lb.	.36½	.50
Durez 12687 (and 12707)	lb.	—	.32
Durez 13355	lb.	—	.26
Marbon B	lb.	.65	.75
S and S-1	lb.	.36	.43
Marmix	lb.	.36	.43
Pliolite S6 Resin	lb.	.36	.37
G Masterbatch	lb.	.35	.36
G50 Masterbatch	lb.	.35	.36
R Masterbatch	lb.	.38	.39
Polyco 220	lb.	.13	.15

RETARDERS

ESEN	lb.	.34	.39
Retarder ASA	lb.	—	.45
Retardex	lb.	—	.51

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Mineral Rubber

38	ton	26.00	32.50
Black Diamond	ton	26.00	27.50
Byerlyte	ton	42.50	57.50
Gilsonite, Selects (c.l.)	ton	33.50	34.50
Hard Hydrocarbon (dms.)	ton	42.00	44.00
Herron Flake	ton	47.50	48.50
Mineral Rubber, solid	ton	41.60	43.00
Parmr (drums)	ton	26.00	30.00
Pioneer	ton	33.00	60.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.337	.416
Brown	lb.	.153	.3335
Dispersed	lb.	.275	.490
Neophax	lb.	.190	.356
White	lb.	.144	.351

Miscellaneous Rubber Substitutes

Gilsowax	lb.	.04½	.05
Insulac	lb.	.06	.06½
Resin No. 1098 (drums)	lb.	—	.65
No. 1198	lb.	.31	.35

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Acetone (dlvd.)	lb.	.08½	.10½
American Dipentene	gal.	.38	.39
Amsco Lactol Spirits (t.c.)	gal.	—	.16
Rubber Solvent (t.c.)	gal.	—	.15
Solv A (t.c.)	gal.	—	.22
Solv B (t.c.)	gal.	—	.26
Special Napthalite (t.c.)	gal.	—	.15
Textile Spirits (t.c.)	gal.	—	.16
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	—	.08
Benzol 90%	gal.	.17	.24
Butyl Acetate (t.c.)	lb.	—	.175
Butyl Alcohol (t.c.)	lb.	—	.175
Secondary (dlvd.)	lb.	.10½	.12½
Tertiary (dlvd.)	lb.	.12	.14
Carbon Bisulfide, Tech.	lb.	.05	.08
Carbon Tetrachloride	gal.	—	.80
Cosol 1	gal.	.30	.38
Cosol 2	gal.	.30	.38
Cyclohexane	lb.	.095	.11
Cyclohexanone	lb.	.25	.27
Diacetone, Pure (dlvd.)	lb.	.12	.14
Dichlorethyl Ether (dms.)	lb.	.165	.17
Formal (dms.)	lb.	.265	.27
Dichloropentane (l.c.l.)	lb.	—	.04½
Dipentene 122 (dms.)	gal.	—	.39
Ethyl Alcohol (t.c.)	gal.	—	.96
Ethylene Dichloride (drums, dlvd.)	lb.	.08	.09½
Halowax Oil	lb.	.22	.37
Heptanes (t.c.)	gal.	—	.15
Hexalin Cyclohexanol	lb.	.20	.22
Hexanes (t.c.)	gal.	—	.15¾
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.45	.57½
Ether, Ref. (dlvd.)	lb.	.04½	.06½
Mesityl Oxide (dlvd.)	lb.	.1350	.1850
Methanol (dms., dlvd.)	gal.	.28	.475
Methyl Acetone, Syn. (drums, dlvd.)	gal.	.615	.65
Methyl n-Amyl Ketone (drums)	lb.	.37	.39
Methyl Ethyl Ketone	lb.	.10	.12½
Methyl Isobutyl Ketone (dlvd.)	lb.	.14	.145
N-5 Pentane Mix. (t.c.)	gal.	—	.11½
N-6 Hexanes (t.c.)	gal.	—	.14
N-7 Hexanes (t.c.)	gal.	—	.13
Petrolene (t.c.)	gal.	—	.10½
Picolines, Apha, Refined	lb.	.75	1.00
Mixed	lb.	—	.45
Pyridine, Refined	lb.	.80	.89
Quinoline	lb.	.50	.60
Rubber Solvent (t.c.)	gal.	—	.12½
Rubsol (t.c.)	gal.	—	.08625
Skellysolve B (Hexanes) (t.c.)	gal.	—	.141
C (Heptanes) (t.c.)	gal.	—	.133
E (Octanes) (t.c.)	gal.	—	.155
R (Solvent Naphtha)	gal.	—	.109
Solvenol	gal.	—	.39
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100 (t.c.)	gal.	—	.2812
150 (t.c.)	gal.	—	.2812
Sunny South Dipentene	gal.	.38	.39
Toluene (drums)	gal.	—	.28
Toluol (t.c.)	gal.	—	.23
Trichlorethane	lb.	.11	.12
Triglycol Dichloride (dms.)	lb.	.519	.59
Tromex	lb.	.078	.083
X-7 Sp. Heptanes (t.c.)	gal.	—	.11
Xylene (drums)	gal.	—	.28

STABILIZING AGENTS (for Vinyl Resins)

Dutch Boy DS-207	lb.	—	.54
Plumb-O-Sil A	lb.	—	.28¾
Tribase	lb.	—	.26¼
Eagle Basic Silicate White Lead	lb.	.21	.22¾
Lead Stearate, Precip.	lb.	.55	.57
Fused	lb.	.60	.62
Lithium Stearate	lb.	.75	.77
Stabelan A	lb.	.55	.65
Stabilizer V-7939	lb.	—	.60
Stabilizer JCX	lb.	.49	.51
SN	lb.	—	.42
V-1-N	lb.	.44	.50
V-9	lb.	—	.85
Vanstay	lb.	.33	.35

SUN CHECKING AGENTS

Antisol	lb.	.25	.26
Heliozone	lb.	.25	.26
Sunproof	lb.	.25	.30
Jr.	lb.	.18	.23
Tonox	lb.	.50	.59

TACKIFIERS

Advaresin 100	lb.	.13½	.14
Agchem RC 30	gal.	.65	1.34
Amberol ST-137X	lb.	.33	.33½
Beckopol 1400 (dlvd.)	lb.	.2650	.27
Dutrex 44	gal.	—	.919
E-310 Resin Emulsion	lb.	—	.14
Galex (drums)	lb.	.1325	.1725
Koresin	lb.	.46	.58
Liquid Rubber Flux	lb.	—	.125
Pentalyn Resins (dlvd.)	lb.	.19½	.22½
Resin V	lb.	—	.23¾
Rubtack	lb.	—	.12
Staybelite Esters (dlvd.)	lb.	.2100	.2150
Super-Beckacite No. 1001 (dlvd.)	lb.	.34	.34½
Tackifier 493-49B	lb.	.15	.17
700-25A	lb.	.14	.16
U2-24	lb.	.11	.13
Vistac No. 1	gal.	—	1.32
No. 2	gal.	—	1.66
No. 4	gal.	—	1.80

THICKENERS (FOR LATEX)

Acrysol GS	lb.	.14½	.22
Betanol (drums)	lb.	—	.70
Emulsorex No. 5	lb.	—	.35
Polyco 296	lb.	.13	.15
Propylene Laurate (dms.)	lb.	—	.36
Sodium Silicate	lb.	.01	.02

VULCANIZING AGENTS

Selenium

Vandex	lb.	—	2.00

Sulfur

Blackbird	cwt.	—	2.05
Crystex (l.c.l.)	lb.	.19½	.23
Dispersed Sulfur	lb.	—	.09
No. 2	lb.	.10	.15
Devil (c.l.)	cwt.	—	1.35
Insoluble Sulfur 60	lb.	.13	.13½
Spider	cwt.	—	2.05
Star (c.l.)	cwt.	—	1.85
Tire	cwt.	1.50	2.00
Tube (c.l., dlvd.)	cwt.	2.00	2.60

Tellurium

Latex Telloy	lb.	—	2.00
Telloy	lb	—	2.00

Miscellaneous Vulcanizing Agents

VA-3	lb.	.55	.65
Vultac No. 1	lb.	.38	.45
No. 2	lb.	.38	.45
No. 3	lb.	.42	.49

WASHING & FINISHING AGENTS

Apcolene (t.c.)	gal.	—	.09¾

WETTING AGENTS

Advawet No. 10	lb.	—	.35
No. 15	lb.	—	.18
No. 33	lb.	.40	.43
Aerosol OT 70% Clear	lb.	.80	1.00
Agchem SA-15 (16, 18)	lb.	.17	.29
Alrosol (dms.)	gal.	—	.48
Aquarex ME	lb.	—	.92
NNS	lb.	—	.60
NS (dlvd.)	lb.	—	.75
Areakap 50	lb.	.30	.38
Dry 100	lb.	.60	.72
Aresket 240	lb.	.30	.38
Dry 300	lb.	.60	.72
Aresklene 375	lb.	.42	.57
Dry 400	lb.	.70	.84
Lecithin	lb.	—	.22
Santomerse D	lb.	.43	.65
S	lb.	.12	.25
Sorbit P	lb.	—	.28
Stablex G	lb.	—	.70
Triton K-60	lb.	.33½	.41
N-100	lb.	.59½	.67
R-100	lb.	.14½	.25
720	lb.	.30½	.38
770	lb.	.21¾	29¾
Vultamol	lb.	—	.17½

MISCELLANEOUS CHEMICALS

Acto 450 (550-W, 600, 630)	lb.	.109	.145
Agchem SA-17	lb.	—	.29
Aquarex SMO	lb.	—	.50
A.S.T.M. Oil No. 1 (and No. 3)	gal.	1.00	1.15
Copper Inhibitor X-872-L	lb.	—	1.75
2-Ethylhexanol (dms.)	lb.	.25	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.31½	.32
MODX (tons)	lb.	—	.29½
Para Resin No. 1784	lb.	—	.09¾
No. 2457 (c.l.)	lb.	—	.04
No. 2718 (c.l.)	lb.	—	.04
pHR	lb.	—	2.00
Pigmented Filmite	lb.	—	.16½
Polyvinyl Methyl Ether	lb.	—	1.00
Reference Fluid SR-6	gal.	.85	1.00
SR-10	gal.	.60	.75
Resin No. 1226	lb.	.31½	.36½
Resorcinol	lb.	—	.64
Rio Resin	lb.	.50	.52
Santocel	lb.	—	.50
Sublac	lb.	.31	.34
Synpep N (drums)	lb.	—	.54
Thiokol LP-2	lb.	—	.90
LP-3	lb.	—	.90
Tysonite	lb.	.21½	.22¼
Vanfre	gal.	2.00	2.50
Vinsol Resin—Lumps	lb.	—	.06

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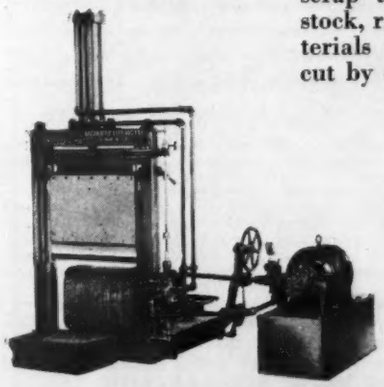

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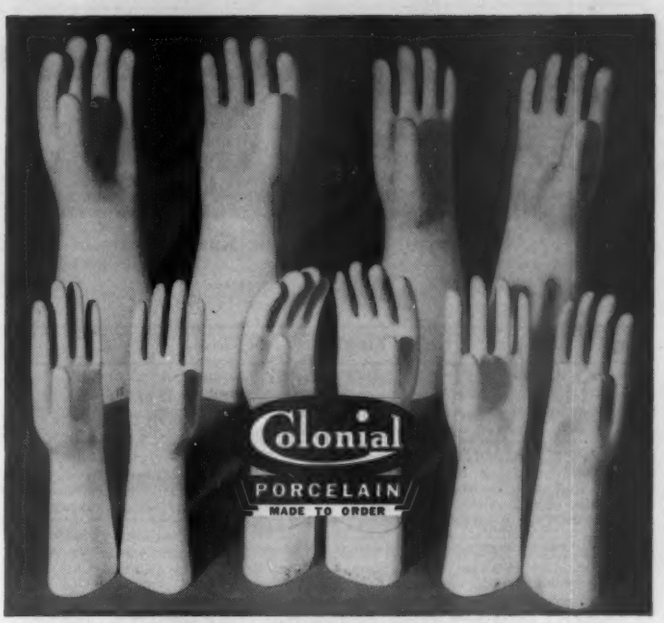

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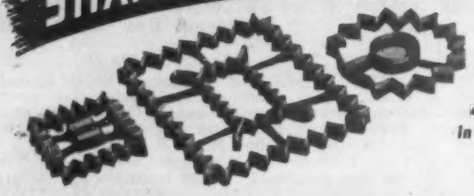

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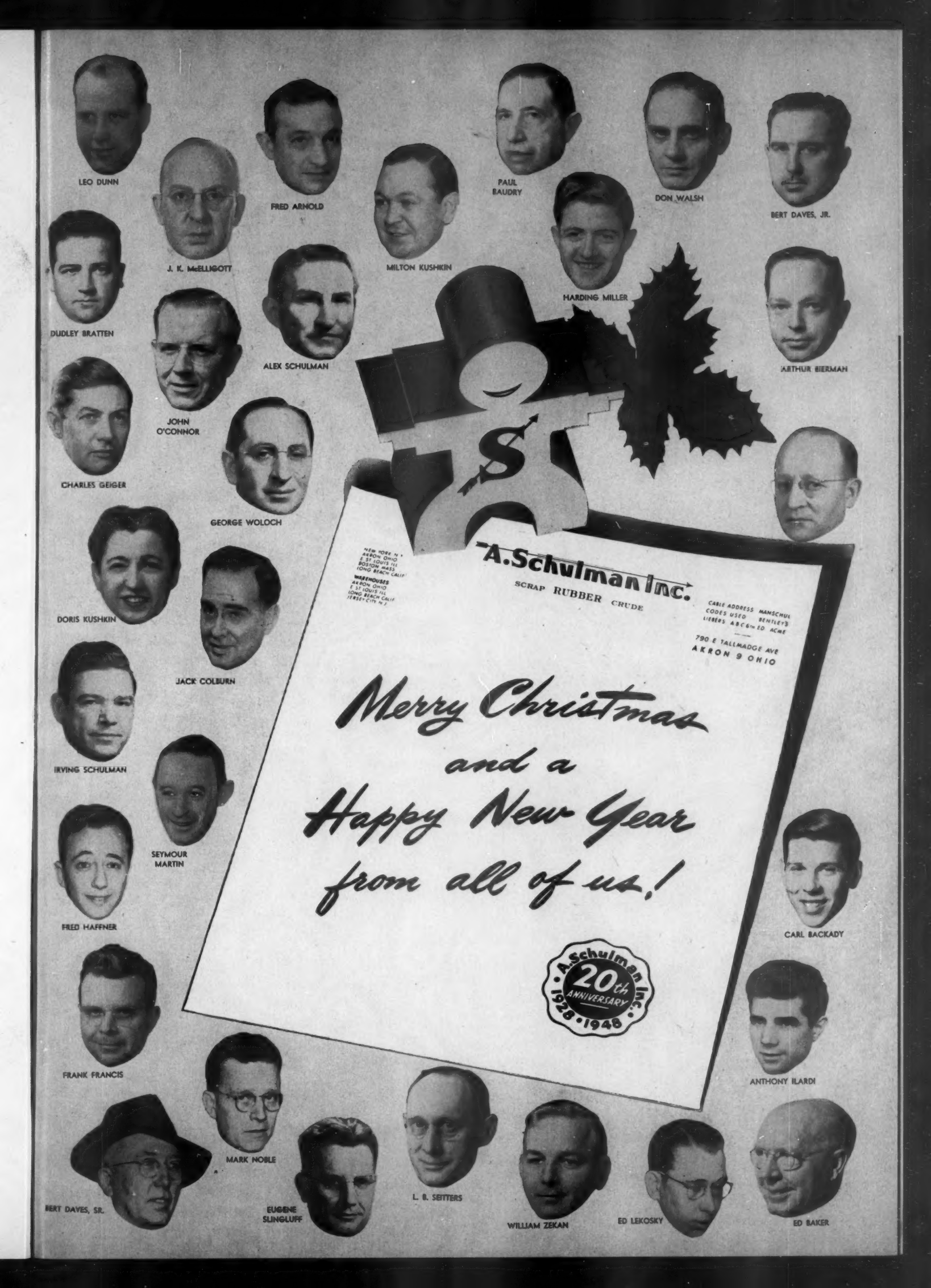
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4. Improved building tack for laminated products such as rolls, sheet packing and hose.

Ask your supplier to tell you about, or investigate the merits of new Hycar OR-15 EP. Or, please write to Dept. HB-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar
Reg U S Pat Off
American Rubber

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Philology—*Love of learning.*

Philblack O—*the philological HAF black that applies itself to the job at hand.*

"Love to learn" about a sure-fire way to make better rubber products? Then here's the story! Philblack O, a high abrasion furnace black, imparts highly desirable qualities to rubber. To mention just a few—excellent flex life—remarkable durability under abrasion—increased resistance to cut and crack growth.

If you have some other specific problem, or if you'd like to find a method to make processing easy—just write for data on the results obtained with Philblack O.

PHILLIPS PETROLEUM COMPANY

Phillips 66

Rubber Chemicals Division

EVANS BUILDING · AKRON 8, OHIO

EFFICIENT LUBRICATING and dusting qualities recommend AERO Brand Stearates in molding plastics, from small complicated forms such as chessmen, to radio cabinets, and as internal lubricants in plastic molding powders.

FOR PAINT formulation, specific grades of AERO Brand Stearates for flatting, pigment suspension and sanding assure uniformity because of their controlled properties.

Strictly Controlled for strict requirements—*AERO* BRAND STEARATES*

The uniformly high quality of AERO Brand Stearates is achieved by a new process, in modern equipment, under continuous chemical control from raw material to final packaging in multi-wall paper bags. Such operation permits a new degree of uniformity and assures continual delivery of stearates "up to specifications" for whatever purposes they are needed – plastics, paint, rubber, cosmetics and many other important applications.

Your products or processes will benefit by this carefully controlled quality of AERO Brand Aluminum, Magnesium, Calcium and Zinc Stearates.

Descriptive booklet will be sent on request. Write for it today. *Trademark

CONTROLLED, UNIFORM particle size of AERO Brand Stearates makes them highly efficient as rubber mold lubricants and compounding materials.

HIGH COVERING POWER, purity and adhesiveness, plus unusually smooth and fluffy texture, make AERO Brand Stearates especially suitable for face powders and other cosmetics.

AMERICAN Cyanamid COMPANY

INDUSTRIAL CHEMICALS DIVISION, DEPT. H

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

A new combination ....

Good-rite ERIE *plus* Good-rite VULTROL

.... that solves "scorch problems" in tire tread processing

NOW rubber compounders can utilize *all* the advantages of reinforcing furnace blacks in natural rubber tire tread formulations. And, it can be done *without* scorching—thanks to a new B. F. Goodrich Chemical Company development.

This new step forward in rubber compounding is a tested and proved combination of two rubber chemicals—Good-rite Erie and Good-rite Vultrol.

Good-rite Erie is an excellent delayed action accelerator, and Good-rite Vultrol is a highly effective retarder at processing temperature.

When they are properly combined, and used with reinforcing furnace blacks, here are the advantages gained:

1. Low heat build-up
2. Freedom from scorch
3. Good flex life and high abrasion resistance
4. Improved resilience and compression set
5. Easy handling and processing

For complete information on the properties and use of this new accelerator-retarder combination, please write Dept. CB-1, the B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

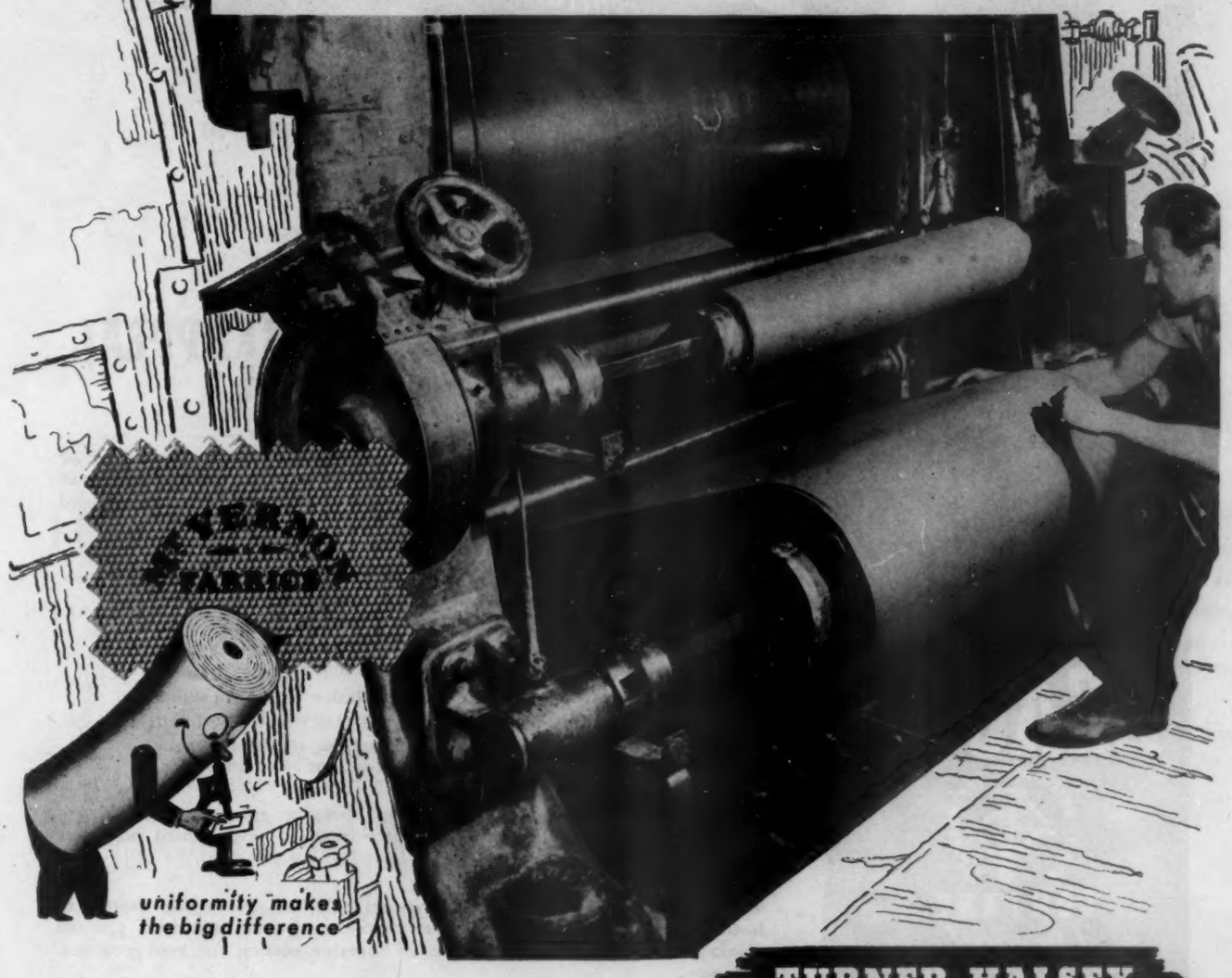
Mt. Vernon's Greater Uniformity Helps Calendering Efficiency

Uniformity of the fabrics you use means a great deal to the smooth, uninterrupted operation of your calendering machines. . . .

That's why Mt. Vernon fabrics are a favored choice wherever calendering is done. . .

Every step in the spinning and weaving of Mt. Vernon is rigidly laboratory-controlled—to insure consistently higher uniformity—to give you uniform absorption, strength, toughness, resiliency—to give you smoother, faster calendering.

For fabric quality that reflects itself in the products you make—specify Mt. Vernon.



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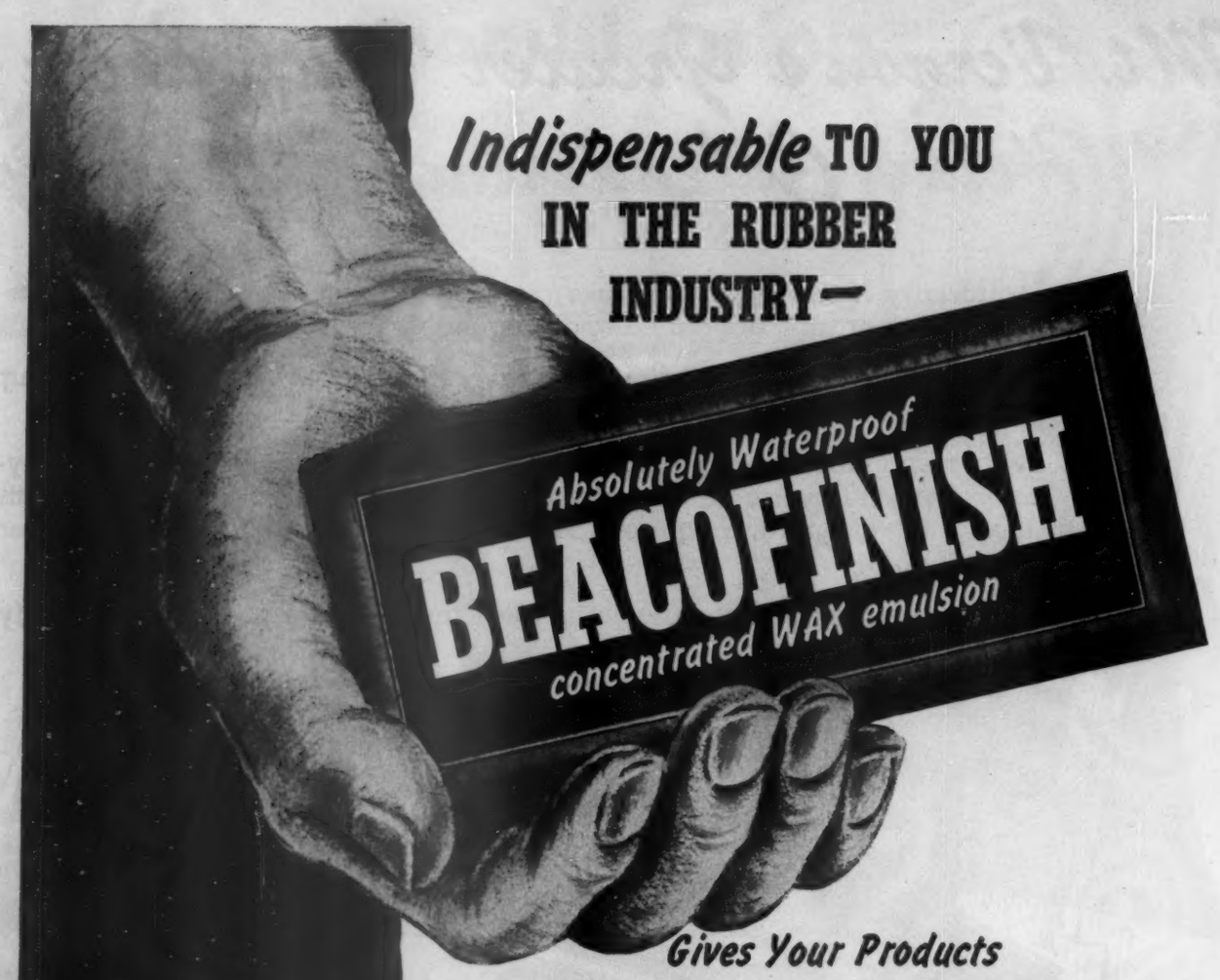

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PROTECTION and SALES APPEAL

at Little Cost!

BEACOFINISH—a unique family of coating materials conceived to give your products greater durability and eye appeal. These highly concentrated wax emulsions that can be diluted with up to four parts of water can be used with the utmost safety and economy.

BEACOFINISH is therefore of four-fold importance to you:—

1. ***It Protects*** your products against their natural enemies—air, sunlight, moisture and excessive handling.
2. ***It Improves*** the appearance of your product for its uniform coating stimulates greater consumer interest.
3. ***It's Economical*** because its high dilution potential (without losing efficiency) allows one gallon to cover 15,000 sq. ft.
4. ***It's Safe*** being a wax in water emulsion, it eliminates the fire and health hazards of volatile-solvent based finishes.

BEACOFINISH can be applied by dipping, sponging, spraying or brushing—dries in about 20 minutes—faster if force-dried—to give a hard protective coating of great elasticity.

BEACOFINISH may be ordered in Neutral or Black, in varying degrees of luster from brilliant to dull. It is so concentrated, from one drum you can obtain potentially up to five drums of superior coating for your products.

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Let us show you how BEACOFINISH can make your products more attractive and saleable—protect them from damage—you from loss—in production and transit!

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For Extra Go
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HERE you see how the use of **Pliolite** S-6 improves such widely different rubber products as clothes-wringer rolls and golf balls.

Add **Pliolite** S-6 to the compound and a wringer roll of excellent hardness and fine white color is insured.

Add this superb reinforcing agent to golf-ball cover stocks and you get the desired resiliency and cut resistance, as well as good click and long flight.

Pliolite S-6 is a superior colorless reinforcing material. It is well adapted to all compounds needing a light-color, low gravity stock of 70-100 durometer hardness with good processing characteristics and moldability. Its reinforcement is positive—coupling extra hardness with negligible loss in elongation. Often elongation is improved.

You'll find **Pliolite** S-6 to be effective with GR-S, Neoprene, Buna N and natural rubber. It is available as a powder for your own mixing, or in master batches in whatever rubber you select. For complete information and sample, write: Goodyear, Chemical Division, Akron 16, Ohio.

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GOODYEAR

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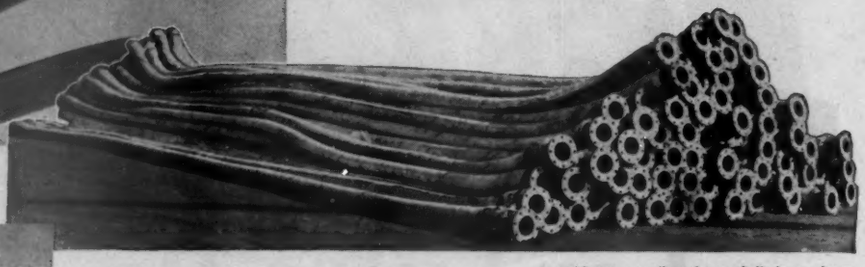
Neoprene casters for industrial trucks. Courtesy L. H. Gilmer Company, Division U. S. Rubber Company.

V-Belt drive on mechanical rotary drilling oil jig. Courtesy L. H. Gilmer Company, Division U. S. Rubber Company.



Neoprene oil suction and discharge hose for marine service. Courtesy Quaker Rubber Corporation, Philadelphia.

Neoprene covered seismograph cable. Courtesy General Geophysical Company.

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for products that must do a hard day's work

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Non-dusting

SHARPLES ACCELERATOR 52-6

MIXED **METHYL-ETHYL** THIURAM **DI**SULFIDE

SPEEDY DISPERSION
MAXIMUM ACTIVITY
EXCELLENT MELTING RANGE

VULCANIZING AGENT
PRIMARY ACCELERATOR
SECONDARY ACCELERATOR
RETARDER FOR NEOPRENE

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CALCO CHEMICAL DIVISION, RUBBER CHEMICALS DEPARTMENT, BOUND BROOK, NEW JERSEY

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STABILITY . . . Marvinol VR-10 is superior in resistance to heat, light and other normally destructive factors.

VERSATILITY . . . Marvinol VR-10 is easy to process . . . may be calendered, extruded, injection molded, used in non-aqueous dispersions, formulated as unplasticized rigids . . . uniquely versatile.

TOUGHNESS . . . Marvinol's high molecular weight offers you extra toughness and "dryness" with long life . . . resists tear, wear, oils, acids.

. . . *here's why industry is turning to* MARVINOL® *the unique* VINYL RESIN

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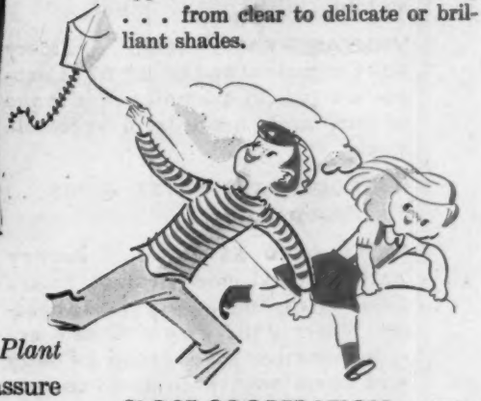
EASILY CLEANED . . . Marvinol-based products are easily and quickly cleaned because of their smooth surface. They're waterproofed, unaffected by mold or fungi.

The New Ultra-Modern Marvinol Plant contains the latest equipment to assure efficient operation, uniform production of the highest quality. Send today for details. Write on your company letterhead to Chemicals Division, Dept. R-1. The Glenn L. Martin Company, Baltimore 3, Maryland.

COLOR . . . Marvinol offers many opportunities for distinctive coloring . . . from clear to delicate or brilliant shades.



CLOSE COOPERATION . . . The Glenn L. Martin Co. compounds and fabricates only in its customer service laboratory for your benefit. We sell only raw materials. Our sales engineers and modern customer research laboratory are ready to help with your processing problems.

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You always get the RIGHT grade for every use — from EMERY!

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STEARIC ACID
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Vegetable FATTY ACIDS
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STEARIC ACID . . . Quality controlled to meet industry specifications.

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VEGETABLE FATTY ACIDS . . . Emery 600 Cottonseed and Emery 621 Coconut are typical examples of a range of fatty acids made from vegetable stocks.

HYDROGENATED FATTY ACIDS . . . Specification Grades.

FATTY ACID ESTERS . . . Emery 2210 Glyceryl monostearate, Emery 2410 diethylene glycol monostearate, Emery 2302 Propyl Oleate are representative of a group of fatty acid esters with high ester content and minimum free alcohol.

POLYGLYCOL ESTERS . . . Several of these are available in development quantities. Since type required depends upon use, specific information should be incorporated in your inquiry.

PLASTOLEIN PRODUCTS . . . Plasticizers for Synthetic Rubber, Vinyl resins. Specific data upon request. Address the Plastolein Dept. Our Sales Service Department is ready to supply complete specifications and use data.

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...for RUBBER

WATCHUNG REDS

RT-428-D — FULL STRENGTH

RM-417-D — EXTENDED FORM

They exhibit excellent brilliance and light fastness. Non-bleeding, they also have good resistance to soap, hot water and rubber curing. Both types are brilliant, medium-shade reds which are easily dispersible in rubber. Excellent for the production of quality products.

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BON RED LIGHT — RT-565-D

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WATCHUNG RED — RT-428-D

These reds are non-bleeding and have a high degree of light resistance (they will stand 144-hour exposure in fadeometer). In addition, they are easily dispersible and very compatible with vinyl resins and the usual plasticizers.

Ask your Du Pont salesmen for details or write:
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...THROUGH CHEMISTRY

DU PONT PIGMENTS

for Rubber and Plastics

MEMORANDUM

To Chief Engineer
Factory Manager
Production Manager

Would you be interested in higher quality of goods produced Plus production per mold increases up to 50% with proportionate reduction in cure cost per piece?

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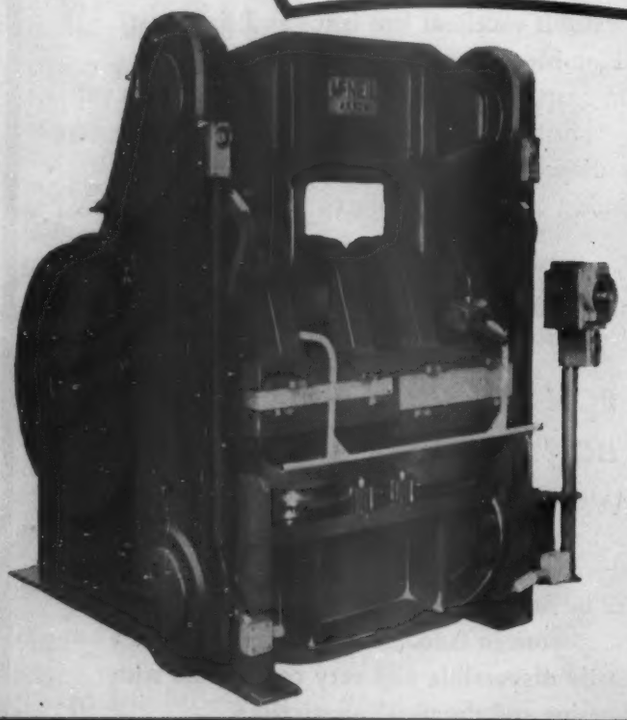
McNEIL AKRON

MECHANICAL GOODS PRESS MODEL 800-24x24 TWIN



- MOTOR OPERATED — NO HYDRAULIC
- 800,000 POUNDS TOTAL PRESSURE
- TWO PAIR 24x24 DRILLED PLATENS INDIVIDUALLY ADJUSTABLE
- 700 POUNDS PER SQUARE INCH PLATEN PRESSURE
- SIMPLE SPEEDY ADJUSTMENTS OF LOWER PLATENS
- ADJUSTMENTS FOR MOLD LOADINGS ZERO TO 200 TONS EACH MOLD POSITION
- TWO 24 x 24 MOLDS MAY BE USED IN SAME OR DIFFERENT THICKNESSES OR ONE 24 x 48 MOLD—1" MINIMUM, 6" MAXIMUM

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MANUFACTURING AGENTS, GREAT BRITAIN—Francis Shaw & Co. Ltd., Manchester, England
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RUBBER WORKING MACHINERY • INDIVIDUAL CURING EQUIPMENT FOR TIRES, TUBES and MECHANICAL GOODS

SRF **STERLING S**

HMF **STERLING L**

Smooth-Out **STERLING SO**

Furnace Blacks for Bulk Handling

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GODFREY L. CABOT, INCORPORATED

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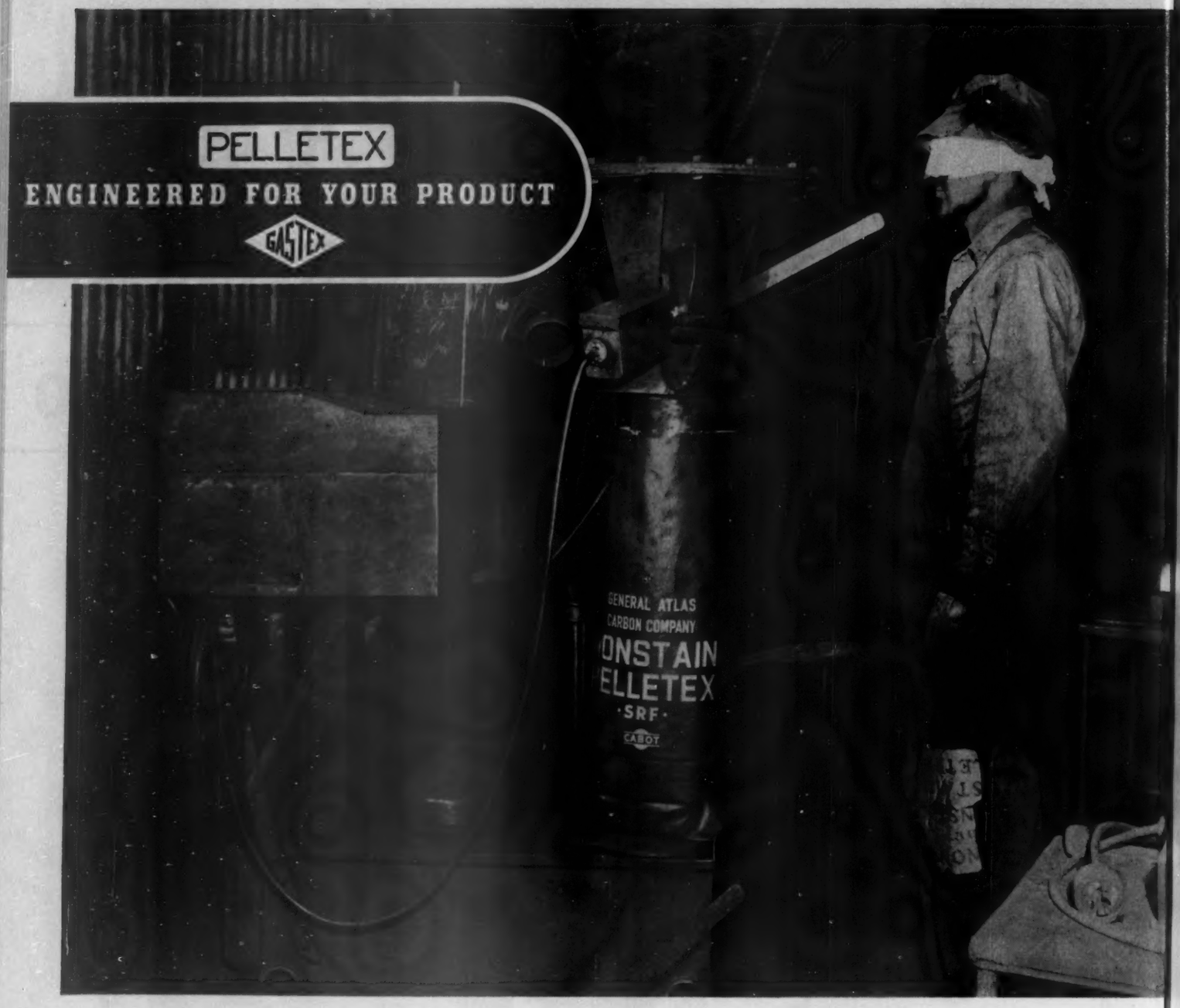
• Write for our Engineering Department's study of Bulk Handling Systems.



Automatically Accurate to 1 Ounce in 50 Pounds

General Atlas "engineering know-how" extends beyond the manufacture of carbon black. The precision weighing of Pelletex is a good example. Pelletex bag weights are unfailingly accurate because General Atlas uses automatic electric eye control, eliminating human error. Just one of many technical controls where General Atlas "engineering know-how" assures a uniform product.

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The B. E. Dougherty Company, Los Angeles and San Francisco • Harrisons & Crosfield (Canada), Ltd., Toronto and Montreal

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Prevents adhesion of hot rubber slabs when piled . . . banishes dust nuisance by replacing soapstone or talc . . . prevents sticking during cure of extrusions and flat pan coiled tubing . . . excellent release agent for molds, mandrels, air bags, belt drums . . . equally satisfactory for washing and finishing inner tubes; imparts satiny finish . . . greatly aids in the processing of insulated wire and cable. The Production Departments and Laboratories of many rubber manufacturers, through years of using GLYCERIZED, give ample proof of its outstanding qualities as a lubricant for natural, synthetic and reclaimed stocks.

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RUBBER MATERIALS DIVISION

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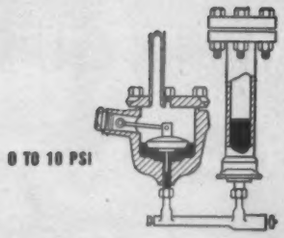


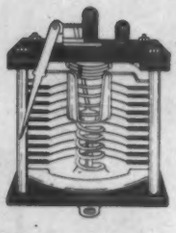
0 TO 10 PSI

30 TO 10,000 PSI

0 TO 30 PSI
(ABSOLUTE)

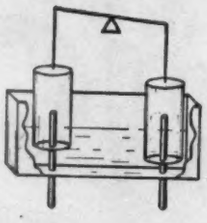
Here's where to start

14 TO 4,000 PSI



10 TO 17 PSI

5 TO 30 PSI



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These measuring elements are the heart of Brown pressure control systems for better processing . . . because precision control starts with precise measurement!

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AROMATIC RESINOUS COMPOUNDING
MATERIAL....
COMPLETE RANGE OF MELTING POINTS
FLAKE, SOLID OR LIQUID
for
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2 IMPROVED RESISTANCE TO FLEX-CRACKING AND CUT-GROWTH
3 HIGHER TENSILE WITH BETTER ELONGATION AND TEAR PROPERTIES
4 SMOOTHER EXTRUSION
HARWICK STANDARD CHEMICAL CO.
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Stymied by high material and labor costs?

NEW NRM TUBERS CAN CHANGE YOUR PROFIT PICTURE

Check your Equipment Against NRM Modern Specifications

STANDARD SPECIFICATIONS
NRM HEAVY DUTY TUBERS
(8 Models—2" to 12" Production Sizes)

Heads—In all production sizes, cylinder adapter heads designed for water cooling are available.

Screws—Machine-finished on special NRM equipment from special, high grade forged steel. Flight surfaces hardened by exclusive NRM process to assure long life. Long rear extension holds screw in alignment.

Cylinders—Heavy cast iron, water jacketed, with removable spiral sleeve equipped with special hardened alloy steel liner.

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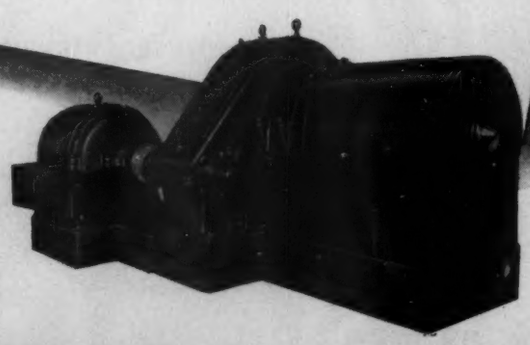

TODAY'S high costs of both materials and labor make it doubly important for you to get the highest possible production efficiency through the use of modern equipment.

New NRM Tubers can bring you additional savings by the more economical use of electrical power; closer dimension control; more accurate control of stock processing temperatures; resulting in a better finished stock.

Check the specifications above and write today for more complete engineering and performance data.

NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON 8, OHIO

Creative Engineering

A high purity *coagulant* especially manufactured for compounders of latex products...

Photo Courtesy American Anode, Inc., Akron, Ohio

Baker's CALCIUM NITRATE

The dependable uniformity and high quality of Baker's Calcium Nitrate gives it an ever-widening appeal to the rubber industry.

Especially manufactured for use by latex compounders, Baker's Calcium Nitrate has the exceptionally high purity demanded in a coagulant. It has superior wetting qualities . . . does not harden in the barrels, and remains in workable condition . . . gives more uniform results, with less trouble in process work.

This product is a technical crystal ranging in size from 1½" to smaller sizes. It is a creamy white color. It contains 3 molecules of water of crystallization.

Baker's Calcium Nitrate helps reduce overall production costs—gives you efficient and economical results! Specify it for your processing.

Baker supplies several other chemicals to the rubber industry—chemicals known for their uniformity and dependability. Whatever your needs, your inquiries for samples and prices are invited. Write to J. T. Baker Chemical Co., *Executive Offices:* Phillipsburg, New Jersey.

6 Baker Chemicals for the Rubber Industry

- CALCIUM NITRATE
- MAGNESIUM OXIDE
- MAGNESIUM CARBONATE
- LEAD ACETATE
- LEAD PEROXIDE
- CARBON DISULFIDE

Baker's Chemicals

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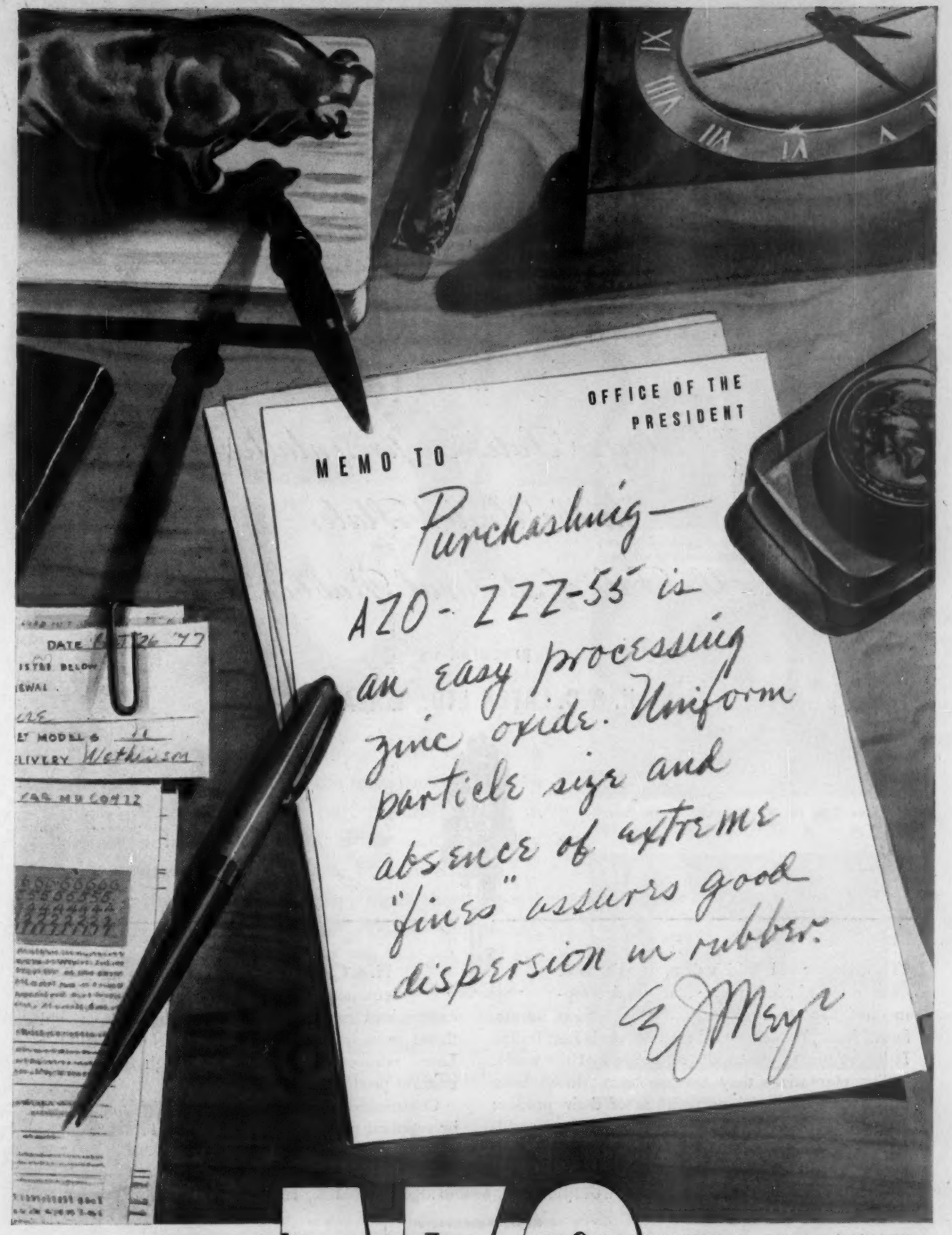
For a holiday that's really unusual, visit this unique resort blessed with an invigorating, health-building climate. Near Las Vegas is gigantic Hoover Dam, an unforgettable spectacle . . . also amazing Death Valley, a delightful oasis in colorful desert land surroundings.

Stop at Las Vegas en route to or from Los Angeles. There's a variety of Streamliner and other fine service from Chicago, St. Louis and Kansas City. You'll enjoy a restful ride over Union Pacific's smooth roadbed, plus excellent meals and service.

Write Union Pacific Railroad, Omaha 2, Nebraska, for information regarding Las Vegas.

UNION PACIFIC RAILROAD

Road of the Streamliners



Uniform-Dependable

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prepared by

H. & C. LATEX LTD., MALAYA

*The century-old British firm, Harrisons & Crosfield, Ltd., is a pioneer in the development of plantation rubber in Malaya, Ceylon, Burma, South India, Borneo, and the Netherlands East Indies. It has grown to pre-eminence throughout the world.

The plantations they manage have always been noted for the careful preparation of their product and the H. & C. mark has long enjoyed a world-wide reputation for reliability. The establishment of H. & C. Latex Ltd. with the most up-to-date equipment, under the supervision of a staff of experienced rubber chemists and engineers, should therefore be welcomed by all users of Natural Rubber Latex, who can be assured of a high quality and uniform product.

Centrifuged and Normal Latex of high quality can be supplied promptly in tank cars and smaller quantities at competitive prices.

General Latex & Chemical Corporation, Cambridge 39, Mass., Telephone KI. 7-0380

Representatives at:

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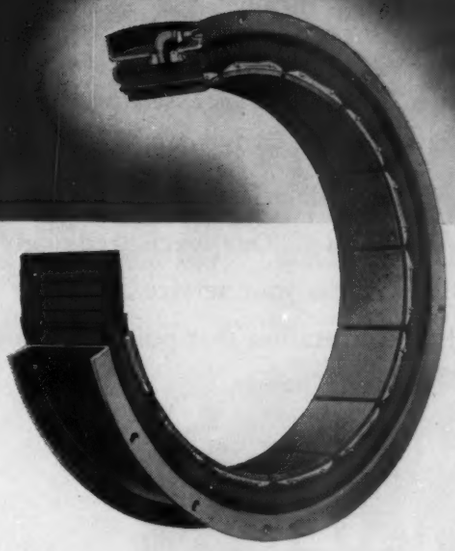
First National Tower, Akron 8, Ohio, Hemlock 2188
Suite 1803, 347 Madison Ave., New York 17, New York, Murray Hill 4-1161
525 Washington Highway, Buffalo 21, New York, University 3800
Pennsylvania Bldg., Room 512, Philadelphia 2, Pa., Rittenhouse 6-8303

Export Agent:

BINNEY AND SMITH CO., 41 East 42nd St., New York 17, N. Y., Murray Hill 2-1960

ONLY ONE MOVING PART

in this Fawick Clutch



Fawick Airflex Clutch or Brake Type CB

Fawick Air-Ring Brake on a 42"x18" Farrel Calender at Crown Rubber Co., Fremont, Ohio.

Fawick Airflex Clutch and Brake on Rubber Mill drive at Rome Cable Co., Rome, N. Y.

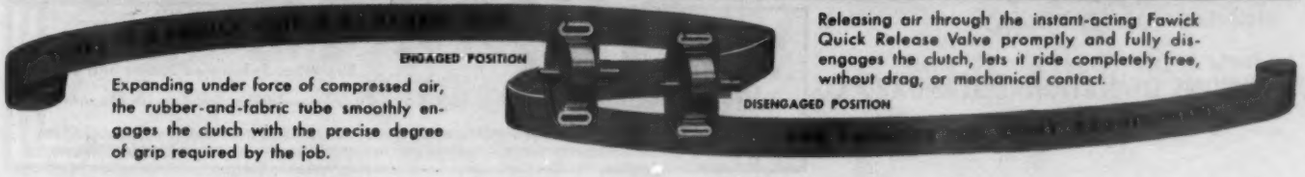
Fawick Airflex Clutch and Brake on two Allen Mills at Haartz-Mason, Inc., Watertown, Mass.

The rubber-and-fabric pneumatic tube faced with friction shoe assemblies is the only moving part in this Fawick Clutch. This part naturally stays in perfect adjustment at all times—automatically compensating for wear of the friction shoes.

Job-tested, Fawick Clutches meet the toughest operating conditions in many fields—petroleum, earth-moving, metalworking, rubber, paper, pulp and others.

Write our engineering department for a recommendation of the Fawick elements best suited for your machines. Address Dept. RA.

FAWICK Airflex CO., INC.
2919 CLINTON ROAD CLEVELAND 11, OHIO



Expanding under force of compressed air, the rubber-and-fabric tube smoothly engages the clutch with the precise degree of grip required by the job.

Releasing air through the instant-acting Fawick Quick Release Valve promptly and fully disengages the clutch, lets it ride completely free, without drag, or mechanical contact.

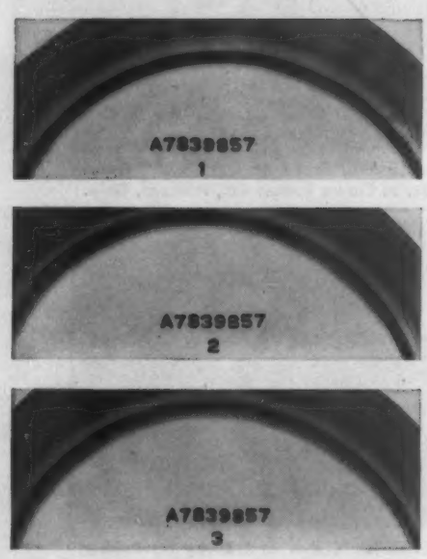
THIS large, powerful fluoroscope is typical of the highly specialized laboratory equipment maintained by National-Standard to help *you* solve problems, to give you all possible aid in building better wire-in-rubber products at lower cost.

Yours for the "Inside Story"

on tire performance and production economies

For example, time and again this machine discloses a valuable "inside story" on the wire in tires and other rubber products. It provides a visual check on possible faults, improvements, production short cuts and savings.

Problems have a way of asserting themselves occasionally. Next time you have one involving a wire-in-rubber product, a National-Standard laboratory report might be of real help. So feel free to call on us. Our specialized engineering and laboratory facilities are at your service . . . ready always to give you the kind of cooperation that points to product improvements and production economy.



National-Standard fluoroscope provides for either visual study or, as shown here, a photographic record of a complete tire in three sections.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

DIVISIONS OF NATIONAL-STANDARD CO.

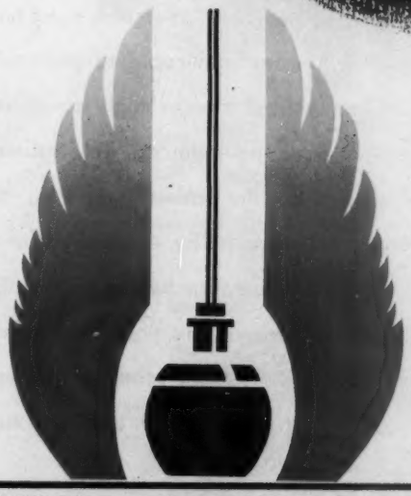
ATHENIA STEEL	*Clifton, N. J.*	Flat, High Carbon, Cold Rolled Spring Steel
NATIONAL-STANDARD	*Niles, Mich.*	Tire Wire, Fabricated Braids and Tape
WAGNER LITHO MACHINERY	*Jersey City, N. J.*	Lithographing and Special Machinery
WORCESTER WIRE WORKS	*Worcester, Mass.*	Round Steel Wire, Small Sizes

THE
ONE AND ONLY
SUPPLIER OF

PARA-FLUX®

® Registered Trade Mark of the C. P. Hall Co.

IS THE
C. P. Hall Co.



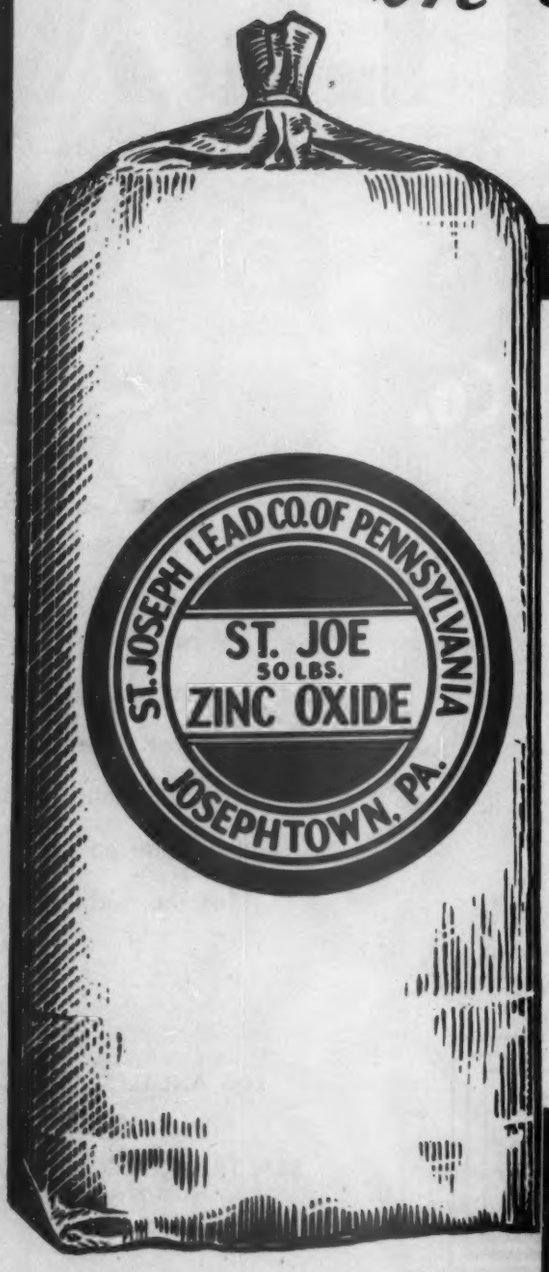
Since 1925 The C. P. Hall Co. has supplied the rubber industry with PARA-FLUX.® Many substitutes have appeared on the market since that time, but PARA-FLUX® continues to be the standard softener and plasticizer for the rubber industry.

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

AKRON, OHIO
LOS ANGELES, CALIFORNIA
CHICAGO, ILLINOIS
SAN FRANCISCO, CALIFORNIA

PROGRESS

in Quality



One principle governs the production of ST. JOE lead-free ZINC OXIDES; it has always done so; it is, above all else, to make as nearly perfect a product as is humanly possible. To this end, every new, promising development applicable to production techniques in our field is searchingly scrutinized and—if proved promising—adopted. This insistence upon perfection is not the easiest way; it is, rather, the natural result of a policy established by the management of this company before the first ton of zinc oxide was produced. This policy has made the St. Joseph Lead Company's products outstanding for their consistent high quality among consumers of lead-free zinc oxides.

ST. JOSEPH LEAD COMPANY
250 PARK AVENUE, New York 17, N.Y.
• ELdorado 5-3200 •

SANTICIZER 141...

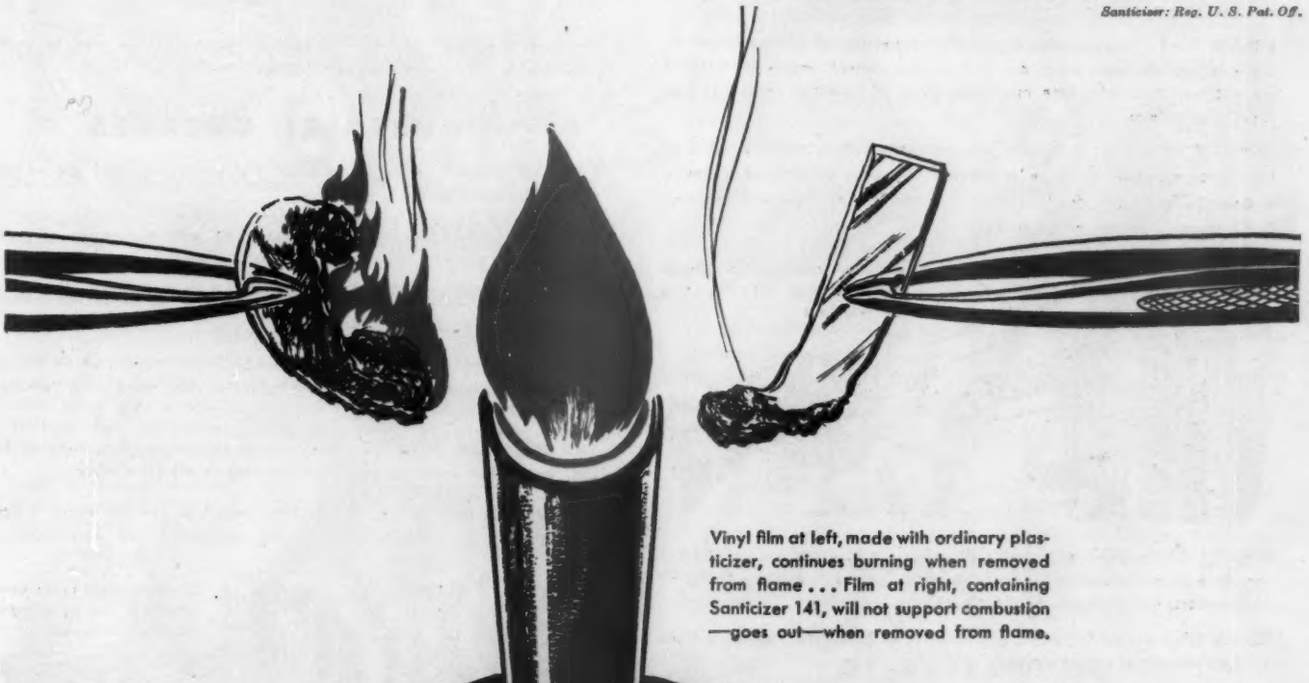
simple test proves fire-retardant qualities

An easy test—made over match or burner flame—proves the outstanding fire resistance of Santicizer 141. Vinyl film made with this newest Monsanto plasticizer will burn only as long as it is in direct contact with flame . . . Flame removed, fire goes out! This action is in marked contrast with what happens to vinyl films made with ordinary plasticizers—most of them burn completely in a few seconds.

While giving excellent fire resistance, Santicizer 141 also contributes flexibility and toughness to heavy and light-gauge polyvinyl chloride films. Only this plasticizer will give so many qualities desirable in finished products . . . low toxicity, high compatibility with vinyls, low volatility, softness and drape, resistance to weathering, low temperature flexibility.

Santicizer 141 is now available in tank car, drum car or L.C.L. quantities . . . Ask any District Sales Office for full information, or write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, Desk A, 1708 South Second Street, St. Louis 4, Missouri.

Santicizer: Reg. U. S. Pat. Off.



Vinyl film at left, made with ordinary plasticizer, continues burning when removed from flame . . . Film at right, containing Santicizer 141, will not support combustion —goes out—when removed from flame.

MONSANTO
CHEMICALS AND PLASTICS

District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal.

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
Desk A, 1708 South Second Street, St. Louis 4, Missouri
Please send me full information on Santicizer 141.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

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SUN "JOB PROVED" PRODUCTS CUT COSTS,

Sun products have been "Job Proved" in the lubrication of almost every type of mining, manufacturing, power, and transportation equipment . . . in refrigeration and air-conditioning . . . in metal cutting, tempering, and quenching . . . in the processing of textile fibers, leather, natural and synthetic rubbers . . . in the impregnation of electrical, electronic, and packaging materials of many kinds.

To help you solve your production problems, Sun Oil Company offers a wide selection of "Job Proved" petroleum products, plus the experience of Sun Engineers. Their know-how and detailed product information are yours for the asking. Call your local Sun office, or write Dept. RA-1.

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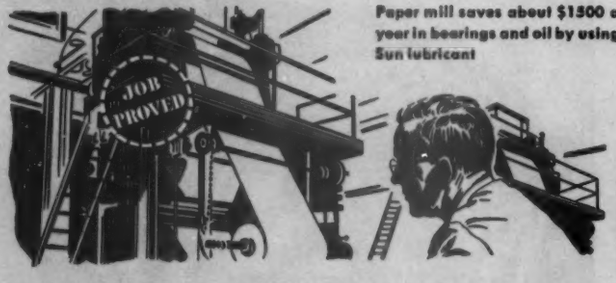
INDUSTRIAL OILS

SUNVIS 900 OILS—High-viscosity-index, paraffinic-type oils—of uniform O F pour point—fortified against rust, corrosion, oxidation, and sludge. The finest available lubricant for turbines, hydraulic systems, and similar applications.

SUNVIS HD 700 OILS—High-viscosity-index oils containing additives which minimize oxidation and give detergency. Ideal lubricants for internal combustion engines subjected to continuous heavy loads under the most adverse conditions.

SUNVIS OILS—Solvent-refined paraffinic-type oils of uniform high viscosity index, low pour point, and low carbon content. Especially suitable for application to long-time use in all types of industrial reservoirs and circulating systems.

DYNAVIS OILS—Low-pour-point, high-viscosity-index, inhibited oils, containing an additive which helps prevent formation of harmful corrosive and sludge-forming acids. Well suited for engines fitted with alloy bearings and operated at high temperatures.



Paper mill saves about $1500 a year in bearings and oil by using Sun lubricant

SOLNUS OILS—Well-refined straight mineral oils. Stand up under hard use for long periods of time. Recommended for use in machine tools, air compressors, certain types of diesels, etc.

CIRCO OILS—Used for general lubrication of industrial machinery when straight mineral oils are required.

SUNTAC OILS—100%-petroleum products which have been compounded to increase their adhesiveness. Recommended for general lubrication of all machines subjected to sudden shocks and load reversals. Cling to the parts to be lubricated.

STEAM CYLINDER OILS—High flash and fire point lubricants for either saturated or superheated steam conditions and for worm-gear speed-reduction units.

SUN CAR JOURNAL OILS—Dark oils meeting A.A.R. Specifications. For use in waste-packed bearings of railroad equipment.

SUN DELAWARE OILS—Dark oils for general lubrication on older types of industrial machinery.

SUNOCO WAY LUBRICANT—For use on tableways. Eliminates chatter and scoring . . . resists corrosion. Has good metal-wetting and adhesive properties, ample viscosity, and E. P. qualities.

SUN MARINE ENGINE OILS—Compounded with special emulsifying agents in order to provide adhesion to, and lubrication of, working parts in the presence of water. For the lubrication of bearings, eccentrics, crossheads, and various other parts of steam engines.

ROCK DRILL OIL—High-film-strength adhesive oil. For use in jackhammers, stopers, drifters, and similar equipment.

INDUSTRIAL GREASES

SUN CUP GREASES—Water resistant. For grease-cup and grease-gun application when service is normal.

SUN GUN GREASES—Smooth greases made with medium-viscosity oil. Stable under pressure in power and booster guns.

ADHESIVE PRESSURE GREASES—Won't drip or splash. Excellent lubricants for open-gear applications.

SUN DARK PRESSURE-SYSTEM GREASES—For power-driven central grease lubricating systems in heavy industries. Also used as a "medium cup grease."

SUN MINE CAR GREASES—Available in several grades. Suitable for both antifriction bearings and plain-bearing cavity-type wheels.

SUN MINING MACHINE LUBRICANT—Semifluid. For use where a light but adhesive grease is required. Resists separation and decomposition.

Chemical plant saves about $8000 per year by adopting Sun Pressure Grease

SUN ROLLER BEARING GREASES—For use on electric motors and generators and high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS—Black adhesive open-gear compounds and

"JOB PROVED" IN EVERY INDUSTRY

SUN PETROLEUM

SPEED PRODUCTION, IMPROVE QUALITY

wire-cable greases. Recommended for power presses, mining machinery, worn reduction mills, crushers, pump gears, etc.

SUNOCO TRACTOR ROLLER COMPOUND—For crawler-type tractors. Provides good lubrication with exceptional sealing qualities.

METALWORKING OILS

SUNICUT—Straight (non-emulsifiable) transparent cutting oils. Recommended for automatic screw machines and heavy-duty machining operations. Permit high speed production with excellent finishes, long tool life.

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion. Efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and nonferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to aid development of maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel. Because of their low carbon content and stability under heat, these oils have an unusually long service life.

Machine shop uses Sunicut 209 W as a cutting and lubricating oil —saves up to $1000 a year

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum, brass, and copper.

SUN ANTI-RUST COMPOUNDS—Petroleum-base oils with chemical additives designed to prevent the rusting and corrosion of steel.

REFRIGERATION OILS

SUNISO REFRIGERATION OILS—Have extremely low pour points, extremely low wax-separating characteristics, a high degree of stability and long life. Initially neutral and resistant to formation of detrimental acids under service conditions. Suniso Oils are high quality oils suitable for both high- and low-temperature operations. The most widely used oils in refrigeration and air-conditioning.

Sports arena steps up compressor efficiency 15% by switching to Suniso Oil

TEXTILE-PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water. Highest rating in fadometer tests.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" (fine air-borne lint particles).

Worsted mill obtains easier scouring, better quality, larger yield with Sunotex WO-220

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are kept from being damaged or broken down, and harmful dust is minimized when this product is used.

SUN CORDAGE OILS—Generally used alone, but are adaptable to various formulas used by cordage manufacturers. Selected products, highly compatible with additives.

RUBBER-PROCESSING AIDS

CIRCOSOL-2XH—An elasticator and processing aid for natural rubber and especially for GR-S. Outstanding for sponge rubber.

CIRCO LIGHT PROCESS AID—A processing agent and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber. Used for GR-S to some extent.

SUNDEX-54—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established processing aid for rubber footwear stocks and semihard rubbers.

Rubber plant cuts out production step, eliminates wrinkles and rejects with Circosol-2XH

CIRCOMAR-5AA—A black-colored product for processing natural and GR-S rubber used in tire-making. Also used in reclaiming natural-rubber scrap. Replaces asphalt fluxes. Free-flowing at room temperature.

WAXES

Sun's new wax plant will be completed in 1949. Its many refining innovations and extreme flexibility will permit new types of waxes to be manufactured in large quantities—a procedure heretofore impracticable. A wide range of fully refined paraffin and microcrystalline waxes will be "tailor-made" to meet the requirements of virtually all major industrial applications. Pilot plant samples of several grades are now available.

MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SOLVENTS—Sun Spirits for the thinning of paints, varnishes, and enamels, and for metal-cleaning . . . a pure, water-white petroleum solvent free of corrosive sulphur. Other Sun solvents with special properties are available for the chemical industry.

SUN LEATHER OILS—Mineral-base leather oils. Used for obtaining the desired tensile strength, proper temper, and controlled moisture content. Maintain a light even color . . . mix well . . . distribute evenly.

"JOB PROVED" IN EVERY INDUSTRY

PRODUCTS

SUNOCO

IN CAPS FOR CATSUP

...or SHOES FOR TRUCKS

WITCO PRODUCTS ARE BASIC

The efficiency of basic materials is consistently reflected in products that prove out. For example. Witco stearates impart to plastic products . . . from bottle caps to phonograph records . . . essential qualities for good appearance, good performance, long life. Thanks to Witco's carbon blacks, natural and synthetic rubber gain extra resilience, greater resistance to wear, longer life. Among research-controlled Witco materials . . . chemicals, oils, pigments, carbon blacks, waxes . . . may be found basic contributors to your own controlled standards of production. Investigate Witco's *basic* products for *your* products.

WITCO CHEMICAL COMPANY MANUFACTURERS AND EXPORTERS, SERVING INDUSTRY IN RUBBER, METAL, PLASTICS, PAINT, PAPER, INK, COSMETICS AND DRUGS, CERAMICS, LEATHER, ETC. . . . 295 MADISON AVENUE, NEW YORK 17, N. Y. . . . BRANCHES: BOSTON, CHICAGO, DETROIT, CLEVELAND, AKRON, SAN FRANCISCO, LOS ANGELES . . . LONDON AND MANCHESTER, ENGLAND

TO INCREASE PRODUCTION — and therefore profits — you should choose EEMCO. Here is a line made in a factory with more than 30 years experience in Rubber and Plastic machinery. EEMCO operates its own modern foundry and machine shop, and has every facility including a large stock of motors, controls, and necessary component parts to insure quick delivery. Choose EEMCO for correct design and sturdy dependability. Built for heavy duty and long life, EEMCO saves time and money. Currently, EEMCO is making exceptionally fast deliveries. Write today for quotations.

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RUBBER AND PLASTICS MACHINERY DIVISION

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CADMOLITH COLORS

Yellows

- INSOLUBLE IN ALL VEHICLES
- SOFT AND EASY TO GRIND
- BRIGHT CLEAR COLORS
- NON-FADING TO LIGHT
- ALKALI RESISTANT
- ACID RESISTANT
- HEAT RESISTANT
- NON-SETTLING
- NON-BLEEDING
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With a combination of advantages found in no other red or yellow pigments—the direct result of Glidden leadership in research—Glidden Cadmolith* Colors are now adding new sales appeal and lasting beauty to an amazing variety of products . . . All shades available for prompt shipment!

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View of elevators and storage for bag packing in one of our furnace units at Ryus, Kansas.

Why, Of Course!

A number of your compounds would be better if they contained more Kosmos 20, the semi-reinforcing (SRF) furnace black, and, furthermore, you would have an added advantage in processing. Therefore, for maximum efficiency use Kosmos 20 in more of your compounds.

Standardize on United carbon blacks. Their uniformity and high quality will contribute to the excellence of your products.

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RESEARCH DIVISION

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The most complete line of

Resins

NEVINDENE*

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PARADENE*

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"G" RESIN

"R" RESINS

465 RESINS

Colors

From pale amber to dark brown

Melting Point

5° to 160° C

Uses

In the production of adhesives, electrical insulation, concrete curing compounds and chewing gum.

In the manufacture of floor tile, lacquers, linoleum, paints, paper and pipe coatings, textile coatings, wood penetrants, inks, etc.

In compounding natural and synthetic rubber.
Write for information on their uses in your products!

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PITTSBURGH 25, PA.

Chemicals for the Nation's Vital Industries

BENZOL • TOLUOL • CRUDE COAL-TAR SOLVENTS • HI-FLASH SOLVENTS
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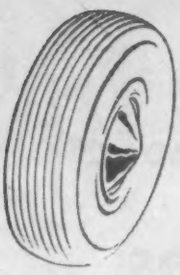
RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

For white and light colored rubber:

TITANOX-RA

(rutile titanium dioxide)

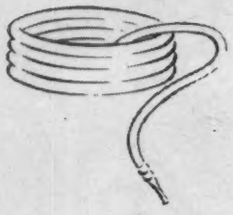
— imparts maximum brightness and tinting strength with minimum pigmentation.



TITANOX-A

(anatase titanium dioxide)

— imparts maximum whiteness with low pigmentation.



TITANOX-RCHT

(rutile-calcium; 30% TiO_2, 70% $CaSO_4$)

— imparts maximum whiteness and brightness at higher pigmentation.

TITANOX pigments are ideal whiteners and brighteners for rubber because of high refractive index coupled with optimum particle size. Their physical and chemical stability make them compatible with natural and synthetic rubbers as well as compounding ingredients.

Our Technical Service Laboratory will be glad to help you with any pigmentation problem. Call or write our nearest office. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 So. Michigan Ave., Chicago 3, Ill.; 2600 So. Eastern Ave., Los Angeles 22, Calif. Branches in all other principal cities.

®TITANOX

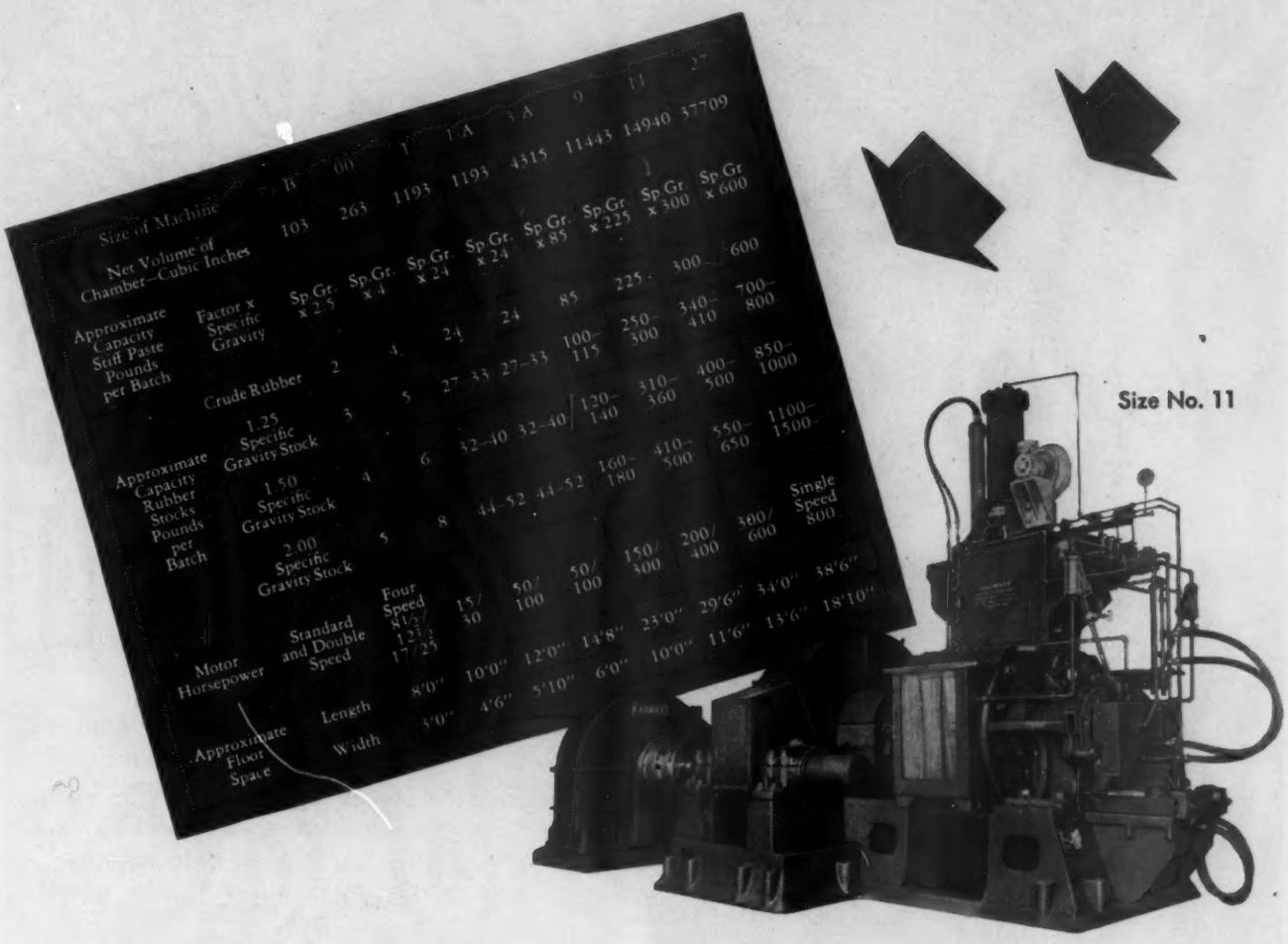
the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

7215

THERE'S A BANBURY SIZE TO SUIT YOUR NEEDS EXACTLY


Size of Machine B 00 1 1A 3A 9 11 27
Net Volume of Chamber—Cubic Inches 103 263 1193 1193 4315 11443 14940 37709
Approximate Capacity Stiff Paste Pounds per Batch
Factor x Specific Gravity
Sp.Gr. x 2.5
Sp.Gr. x 4
Sp.Gr. x 24
Sp.Gr. x 24
Sp.Gr. x 85
Sp.Gr. x 225
Sp.Gr. x 300
Sp.Gr. x 600
Crude Rubber 2 4 24 24 85 225 300 600
1.25 Specific Gravity Stock 3 5 27–33 27–33 100–115 250–300 340–410 700–800
Approximate Capacity Rubber Stocks Pounds per Batch
1.50 Specific Gravity Stock 4 6 32–40 32–40 120–140 310–360 400–500 850–1000
2.00 Specific Gravity Stock 5 8 44–52 44–52 160–180 410–500 550–650 1100–1500
Motor Horsepower
Standard and Double Speed
Four Speed 8½/12½/17/25 15/30 50/100 50/100 150/300 200/400 380/600 Single Speed 800
Approximate Floor Space
Length 8'0" 10'0" 12'0" 14'8" 23'0" 29'6" 34'0" 38'6"
Width 5'0" 4'6" 5'10" 6'0" 10'0" 11'6" 13'6" 18'10"

Size No. 11

Banbury mixers are made in 8 standard sizes, from the size B for laboratory or small production work to the huge No. 27 with its net chamber capacity of 37,709 cubic inches. With such a range of machines to choose from, you can select the mixer that will provide the production you require.

Furthermore, Farrel - Birmingham engineers have developed other production units, such as extruders, warming and sheeting mills and calenders, which are *matched in capacity* with the various sizes of Banburys. This means that a layout can be *engineered* that will eliminate the "choking" or "starving" of any machine in the line. Production can be *designed* to flow without costly interruptions and with manual aid and supervision reduced to a minimum. Isn't this worth investigating?

Before you purchase new processing equipment, call in a Farrel - Birmingham engineer. In the meantime, send for a copy of *NEW* bulletin No. 187, "F-B MACHINERY FOR THE PROCESS INDUSTRIES."

Farrel - Birmingham

A

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Please send me, without cost or obligation, a copy of your new Bulletin No. 187.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

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AS CLEAN AS ...A WHISTLE

RUBBER-FLO is SAFE! It is a non-toxic odorless mold lubricant.

RUBBER-FLO is QUICK! It may be sprayed, brushed or dripped onto the mold. It will not clog a spray gun.

RUBBER-FLO is ECONOMICAL! The savings in maintenance more than pay for it.

RUBBER-FLO is LOW IN COST! It comes in concentrated form and is diluted with water for use.

Rubber manufacturers of diverse lines, such as Mechanical Rubber Goods, Soles and Heels, Sponge Rubber Products, Drug Sundries, Tires and Tubes have found that RUBBER-FLO MOLD LUBRICANT increases production and reduces maintenance.

Write today for your FREE SAMPLE and for further information.

PREVENTIVE MAINTENANCE CO.

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Bridgeport, Connecticut

Effective January 1, 1949

the

INDOIL CHEMICAL COMPANY

a wholly owned subsidiary

of the

STANDARD OIL COMPANY

(INDIANA)

will take over the personnel and sales activities of the Chemical Products Department of the parent Company. This move will permit more efficient handling of our chemical business on a nation-wide basis.

INDONEX Plasticizers
INDOPOL Polybutenes
INDOCENE Aromatics
ALKANESULFONIC Acids
INDOIL Sulfonates and other
INDOIL Chemical Products

We take this opportunity of expressing appreciation of our past pleasant relations, and our hope of expanded but equally pleasant future relations.

INDOIL®
CHEMICAL PRODUCTS

INDOIL CHEMICAL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

for

COLORED

BUTYL INNER TUBES
MECHANICAL GOODS
DRUG SUNDRIES

use—

WHITETEX

● **FINE particle size white pigment. Brightness 90-92. GOOD reinforcing. Excellent *processing*.**

»» SAMPLES SENT PROMPTLY ON REQUEST. ««

SOUTHERN CLAYS, Inc.

33 RECTOR STREET
NEW YORK 6, N. Y.

1901-1949

Forty-eight years of service to the rubber industry.

A Prosperous New Year!

We wish you the fullest measure of success in the year to come.

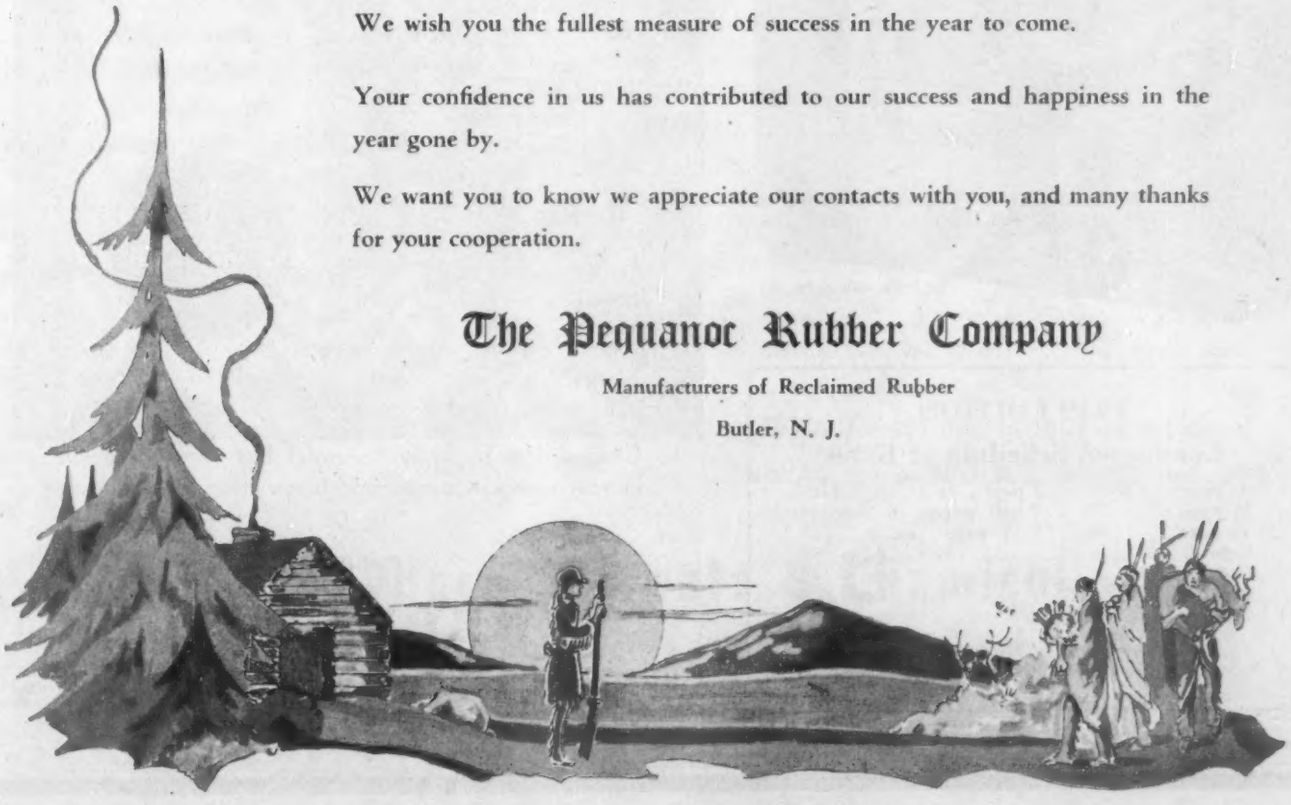
Your confidence in us has contributed to our success and happiness in the year gone by.

We want you to know we appreciate our contacts with you, and many thanks for your cooperation.

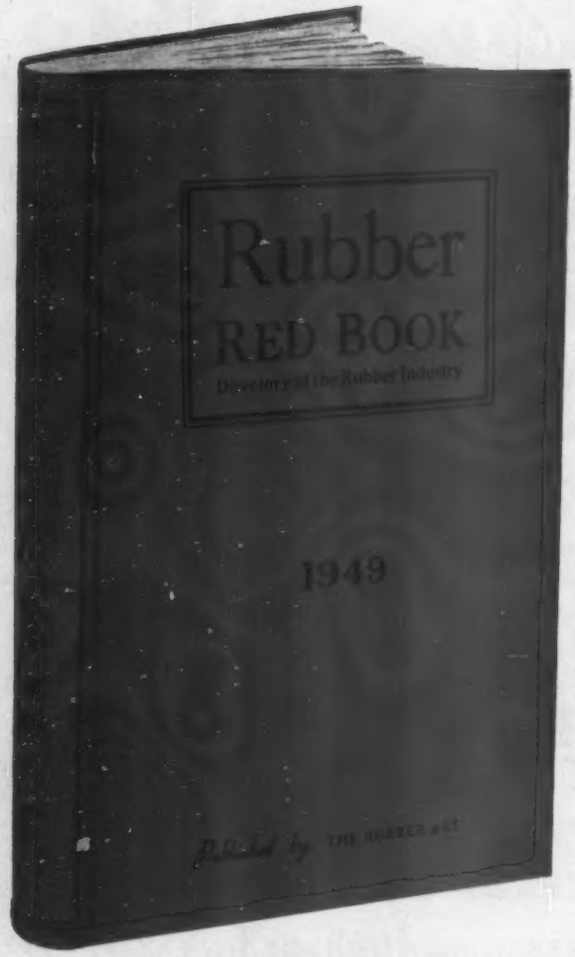
The Pequanoc Rubber Company

Manufacturers of Reclaimed Rubber

Butler, N. J.



A Reminder to Order Space in the 1949 RUBBER RED BOOK!



The Seventh issue of the RUBBER RED BOOK —the 1949 Edition—will be published in June, 1949.

. . . And once again indications are that this issue will surpass all previous editions in completeness as well as in advertising volume.

Each edition of this Directory has contained improvements over previous issues—many of the changes having been suggested by rubber manufacturers themselves. As a result, the last edition (1947) was a volume of 840 pages compared with 372 pages in the first issue in 1937.

Probably no other book receives as much day-to-day use as the RUBBER RED BOOK. Well-thumbed copies on the desks of purchasing agents, chemists, factory managers and others in the rubber industry attest to the frequency with which this Directory is consulted to obtain answers to the many questions that arise in daily plant operation.

That's why the number of advertisers has grown from 100 in the first edition to 275 in the last—why already almost 100 advertisers have reserved space in the 1949 edition, although the only announcement made was a small circular distributed in December.

In the RUBBER RED BOOK your advertisements is available for study when buyers are seeking new sources of supply. The data in your advertisement may be the deciding factor in your favor . . . it's just like having your salesman right there at the opportune moment! Nowhere else can you possibly accomplish so much at such a low cost.

The condensed schedule of rates shown in the box at the left must lead you to ask whether you can afford **not** to use appropriate space in the forthcoming edition.

Closing date for copy is April 1 but we suggest you send in your reservation now and follow it up with copy later.

1949 EDITION

Condensed Schedule of Rates

1 page	$130.	2 pages, ea.	$125.
½ page	70.	2 half pages, ea.	68.
¼ page	40.	2 ¼ pages, ea.	39.
Colors, Red	extra		50.
Other Colors	extra		75.
Bleed Pages	extra		20%

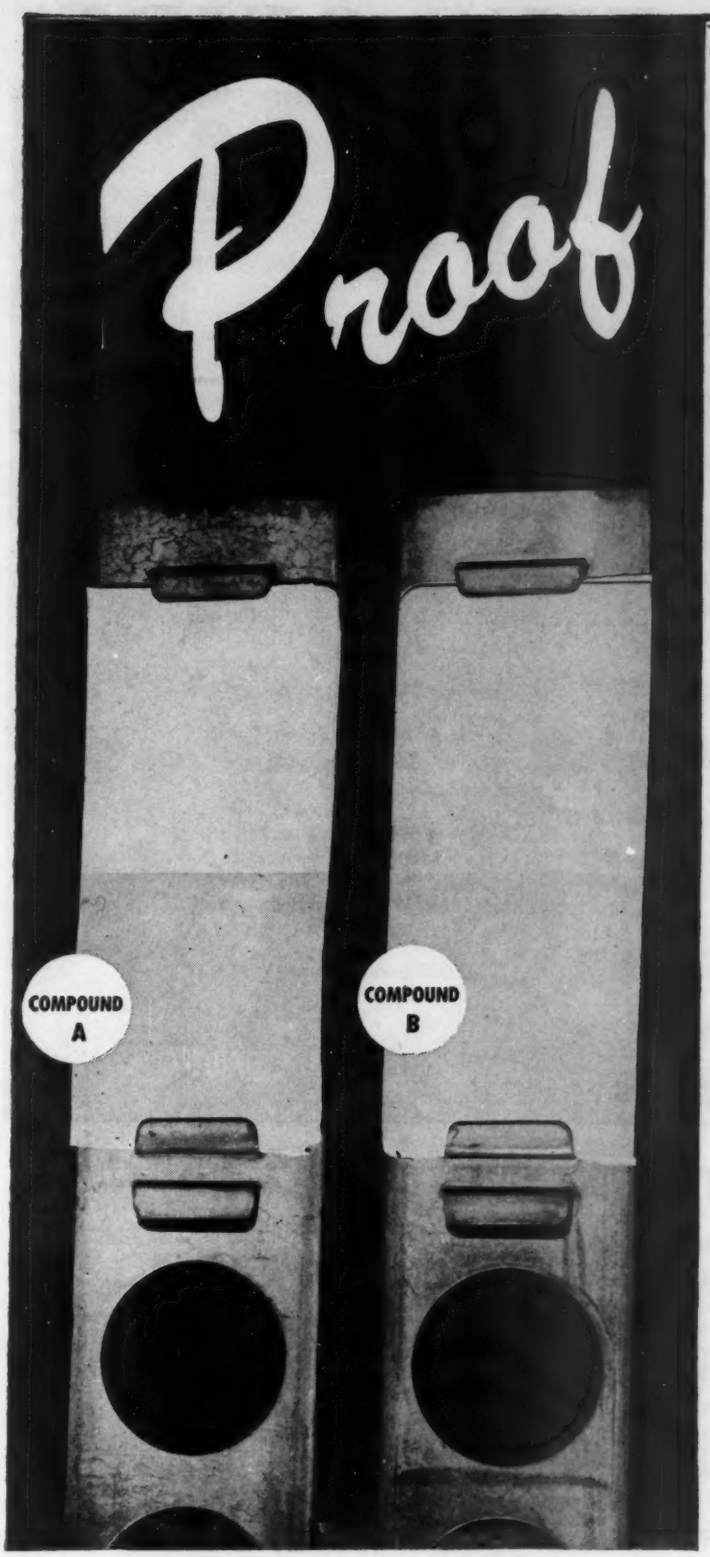
Inserts—Not accepted

For complete rates and sizes write for 1949 rate card.

Published by

RUBBER AGE

250 W. 57th St., New York 19, N. Y.



Unretouched Photo

that Plasticizer

VISTAC #1

INHIBITS DISCOLORATION

In White or Light Colored Stocks

Fadeometer tests made for 44 hrs. graphically illustrate the superiority of white and light colored stocks plasticized with Vistac #1. Upper half of each sample shows original color.

COMPOUND A
Contains 1% Vistac per 100 parts rubber

COMPOUND B
Contains 3% Vistac per 100 parts rubber

Vistac #1 is non-toxic, non-staining, odorless, and does not itself discolor stocks or white enamels.

Vistac #1 is particularly recommended for

- **White Sidewalls**
- **Drug Sundries**
- **Refrigerator Gaskets**
- **Jar Ring Stocks**
- **Vacuum Seals**

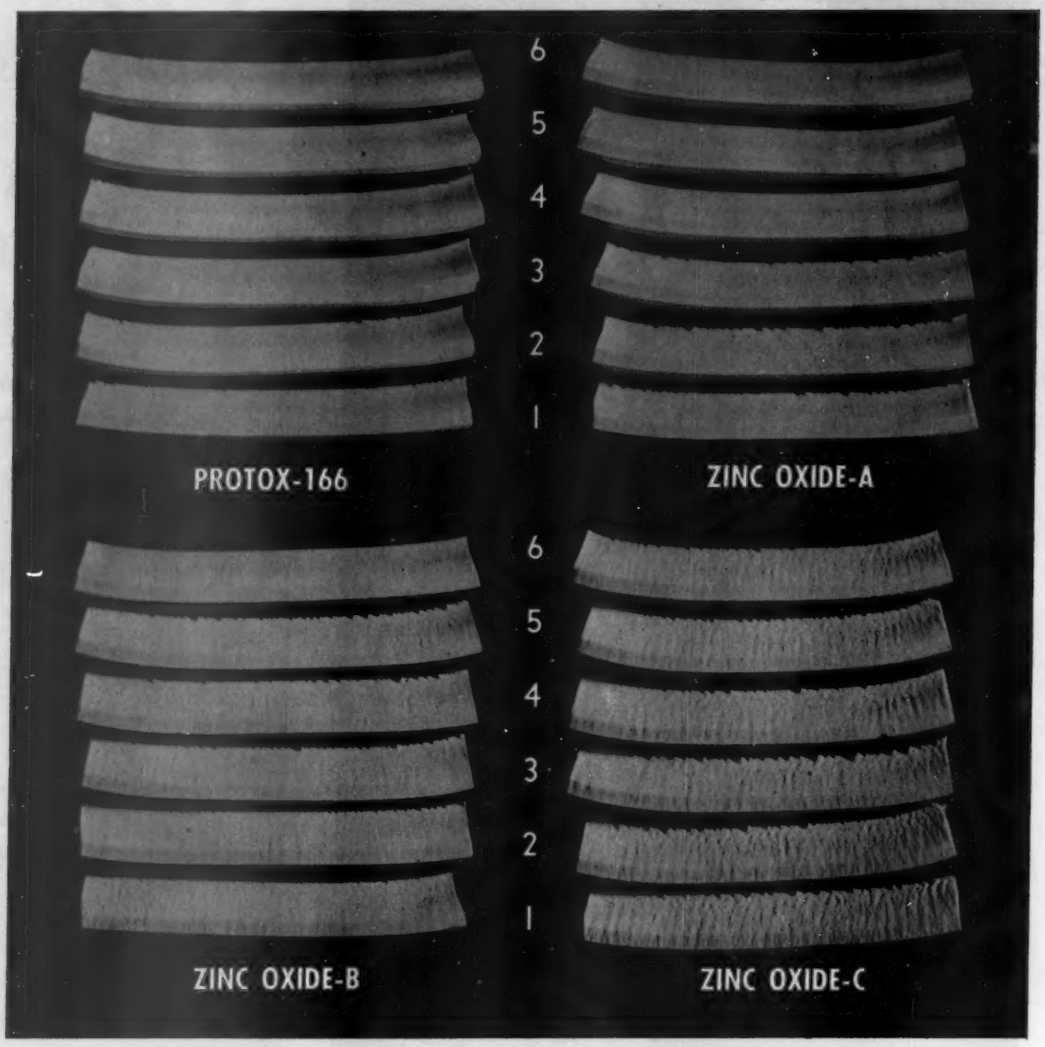
Physical Properties of Vistac #1:

Specific Gravity	0.900
Pounds Per Gallon	7.5
Color	Almost Water-White
Saybolt Univ. Visc. (210°F)	2800+ secs.

Write for our new booklet on the use of
VISTAC #1 in NATURAL RUBBER and GR-S

Advance Solvents & Chemical Corp.
245 Fifth Avenue • New York 16, N. Y.

PROTOX-166 ZINC OXIDE*



GR-S – 10
– 100 PARTS

ZINC OXIDE
– 100 PARTS

PROCESSING PROPERTIES WITH GR-S–10

GR-S-10 was premasticated for 10 minutes on a 42" mill with a roll temperature of 20°C. The following day the several brands of Zinc Oxide were incorporated in approximately 10 minutes. The stocks were warmed-up on a laboratory mill and tubed in the Royle machine with the following conditions: Temperatures–Cylinder 40°C.; Extension 62°C.; Diehead 110°C. The temperatures of the stocks as they left the tuber were 77°C. for all of the brands.

Successive passes through the tuber produced the results shown in the above photographs.

TUBING RATE AND SWELL MEASUREMENTS

	FLOW RATE	Swelling Measurements	
	Gms.Per Minute	From 0.25" to	Per Cent Swelling
Protox—166	127.0	0.357"	42.8%
Zinc Oxide A	114.8	0.356"	42.4%
" " B	122.4	0.374"	49.7%
" " C	134.8	0.385"	54.0%

The swelling measurements were made after chilling for 10 minutes in water.

U.S. Patents 2,303,329 and 2,303,330

HORSE HEAD PRODUCTS

THE NEW JERSEY ZINC COMPANY

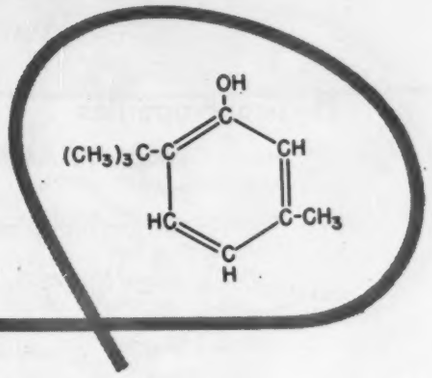
160 FRONT STREET • NEW YORK 7, N. Y.

KOPPERS

MBMC

Mono-tert-butyl-meta-cresol

A NOVEL COMPOUND FOR COMMERCIAL USE



● Mono-tert-butyl-meta-cresol is a clear, liquid alkylated phenol which solidifies at temperatures slightly below room temperature. In this compound, two of the normally reactive nuclear positions are unsubstituted and can enter into reactions typical of phenol.

MBMC is useful in the following fields:

GERMICIDES and DISINFECTANTS

MBMC has a phenol coefficient of 30-50 as measured against E. typhi and Staph. aureus. The compound is useful for formulation into highly effective disinfectants.

RUBBER CHEMICALS

Sulfide and disulfide derivatives of MBMC are useful as anti-oxidants and rubber processing chemicals.

PETROLEUM CHEMICALS

Thiophosphoric esters of MBMC are of interest as additives to premium-grade lubricating oils.

SYNTHETIC RESINS

MBMC can be employed in the production of oil-soluble phenolic resins useful in surface-coating compositions and for the modification of phenolic molding materials.

PERFUMES

MBMC is an excellent raw material for the production of musk ambrette. The MBMC is first nitrated and then etherified to yield the desired product.

For detailed information on Koppers MBMC, or samples for experimental use, send the handy coupon.

Physical Properties of pure MBMC

Form	Clear liquid
Empirical Formula	C_{11} H_{16} O
Freezing Point	21.3°C
Boiling Point	244°C
Specific Gravity—80°C	0.922

Soluble in common organic solvents and aqueous potassium hydroxide.

Koppers Company, Inc.
Chemical Division, Dept. RA-1
Pittsburgh 19, Pa.

Please send me

- ☐ 4 oz. Sample of Koppers MBMC
- ☐ Information on Mono-tert-butyl-meta-cresol
- ☐ Copy of Bulletin C-8-103, Products of the Chemical Division

Name_____

Company_____

Position_____

Address_____

KOPPERS

KOPPERS COMPANY, INC.
Chemical Division
Pittsburgh 19, Pa.

Characteristics of HUBER RUBBER CLAYS

	SUPREX	PARAGON	HI-WHITE R	HYDRATEX R
Physical Properties				
Specific Gravity	2.60	2.60	2.60	2.60
Moisture (max.)	1%	1%	1%	1%
Screen Residue 325 Mesh (max.)	0.17%	0.3%	0.3%	0.02%
Water Settling Test				
(Column height after 48 hrs.)	70–80%	30–40%	35–45%	40–50%
Particle Size				
Minus 2 Microns	80–85%	50–55%	63–68%	69–74%
Plus 5 Microns	4–8%	25–30%	12–15%	8–11%
G. E. Brightness	76–77%	79–80%	80–81%	83–84%
Oil Absorption (cc/100 grs. clay)	34–35	26–27	29–30	32.5–33.5
pH	4.5–5.5	4.5–5.5	5–6	4.5–5.5
Chemical Properties				
Ignition Loss	13.9–14.2%	13.9–14.2%	13.9–14.2%	13.9–14.2%
Silica	44–46%	44–46%	44–46%	44–46%
Alumina	37.5–39.5%	37.5–39.5%	37.5–39.5%	37.5–39.5%
Iron Oxide	1.5–2%	0.5–0.9%	0.4–0.8%	0.37–0.75%
Titanium Dioxide	1–2%	1–2%	1–2%	1–2%
Manganese	None	None	None	None
Physical Properties in Rubber				
Smoked Sheets	100.	100.	100.	100.
Clay	104.	104.	104.	104.
Zinc Oxide	5.	5.	5.	5.
Sulfur	3.	3.	3.	3.
Accelerator	1.	0.75	0.875	0.875
Stearic Acid	2.	2.	2.	2.
		Cure = 60'/260°F		
Modulus @ 300% (p.s.i.)	1580	1160	1360	1260
Tensile (p.s.i.)	3010	2660	2740	2710
Elongation (%)	500	520	520	525
T-50 (°C)	+15.75	+4.6	+10.5	+9.0
Tear (lbs./in. thickness)	195	155	170	180
Hardness (Shore)	57	59	61	62
Abrasion (cc/hr. loss)	68	89	84	75
Extrusion (cc/100 sec.)	93	136	122	127

HUBER J. M. HUBER CORPORATION 342 Madison Avenue New York 17, N. Y.